

BOLBOCERATINE SCARABS OF THE ORIENTAL GENUS *BOLBOHAMATUM* NOV. (COLEOPTERA, GEOTRUPIDAE)

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With 71 text-figures

ABSTRACT

The genus *Bolbohamatum* nov. is proposed to accommodate four species hitherto combined with *Bolboceras* Kirby, and nine new species. The genus, characterized by a spine-bearing lobe separating the middle coxae, is endemic in the Oriental Region. The 13 species are keyed, illustrated, and their distribution is recorded. The following novelties are described: *Bolbohamatum drescheri drescheri* (Java), *drescheri indosinicum* (Indo-China), *drescheri birmanicum* (Burma, Laos); *B. kuijteni* (India), *marginale* (India), *meridionale* (India, Sri Lanka), *phallosum* (India), *pseudogrande* (India), *pyramidifer* (India), *robustum* (India), *syncopator* (India). The four old species are *B. cyclops* (Olivier) (type-species; synn. nov. are *Scarabaeus veter* Fabricius, *Bolboceras subglobosum* Westwood), *calanus* (Westwood), *laevicolle* (Westwood) (syn. nov. *Bolboceras grande* Westwood), *laterale* (Westwood). For three names lectotypes are designated. The phylogeny of the genus is briefly discussed.

INTRODUCTION

The larger Bolboceratini of tropical Asia, i.e. those with a total length between 13 and 23 mm, belong nearly all in one monophyletic group, for which here a new generic name is proposed: *Bolbohamatum*. This monophyly is inferred from the presence of a characteristically shaped, spine-bearing metasternal lobe between the middle coxae (fig. 56), a feature that seems to be unique within both the tribe and the family. The new genus comprises four species described more than a century ago, and nine described below for the first time. Two names possibly relating to *Bolbohamatum* species remained dubious, their types having disappeared.

With some experience the males of most *Bolbohamatum* species can easily be identified on the basis of the diagnostic information presented in this paper; in some cases the examination of the genitalia will prove to be indispensable. The identification of the females will present greater difficulties, because of their rather poor, uniform cephalic and pronotal ornamentation, and because they cannot always be associated with the opposite sex of the same species. The former factor also renders the identification of the occasional underdeveloped male troublesome. More work on *Bolbohamatum* is certainly needed. It seems, nevertheless, undesirable to delay the publication of the present results, were it alone for the fact that the collections of this group cannot be expected to grow

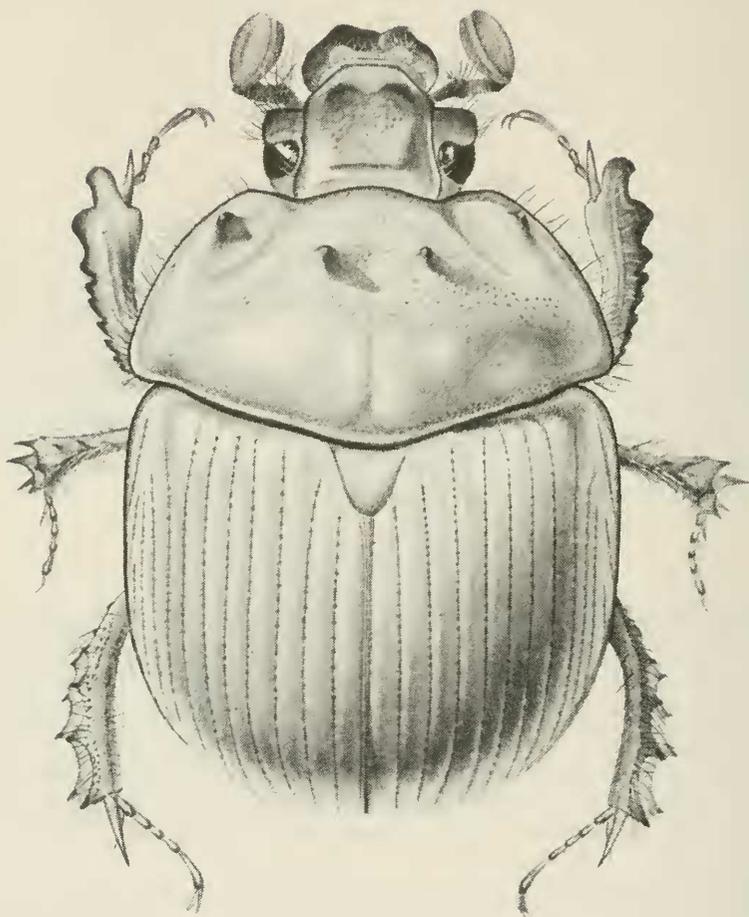


Fig. 1. *Bolbohamatum drescheri drescheri*, holotype (male) from Java. Length ca. 18.5 mm.

significantly in the years ahead. Any supplementary information regarding *Bolbohamatum* will be included in a proposed review of the Asian bolboceratine genera. For more about the scope of this series of papers on Bolboceratini, see Krikken, 1977b.

TECHNICAL REMARKS

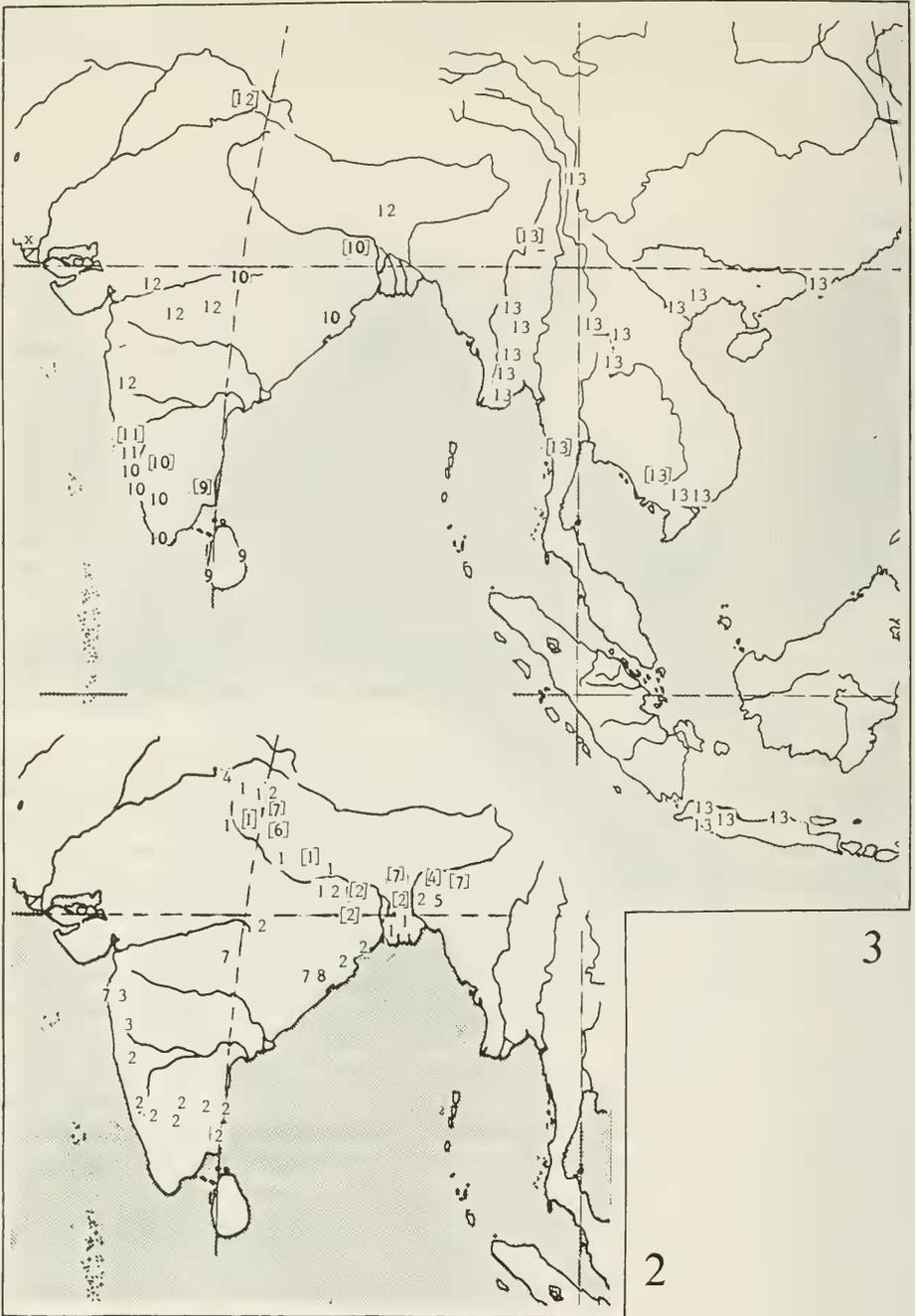
Some points have already been discussed in my *Bolbogonium* paper (1977b). In this treatment of *Bolbohamatum* I have kept the descriptions of the novelties rather concise, and of the other species I give descriptive details only as far as they are taxonomically important (identification, variation, sexual dimorphism).

The parameres and other parts of the phallus are in *Bolbohamatum* usually strongly sclerotized and provide excellent characters for the identification to species. The homologies of these characters, however, are as yet poorly understood. The phallus proper moves within a complex structure (*sagulum), consisting of a (ventral) bottom sledge (*fundus), a pair of lateral flaps, and a roof (*tectum). The parameres frequently have sclerotized protrusions (*paramerites) and sacks (*sacculi); the latter seem to be inflatable. The dorsal side of the basal capsule (in fact consisting of scarcely separated distal and proximal parts) is open, i.e. covered by a membrane. The median lobe (with the penis proper, the internal sac) is usually concealed by the aforesaid parts. The positions of these parts (terms marked with an asterisk proposed ad hoc) are explained in four diagrams (figs. 5—8). The genital characters of the females, as well as the taxonomic value of the sagulum of the males, need further study.

The arrangement and development of the fossorial protrusions on the outer (anterior) side of the middle and hind tibiae are more or less characteristic but difficult to describe. In *Bolbohamatum* these protrusions are bidentate-bilobate and decreasingly pronounced proximad. Usually there is one complete anteapical protrusion (i.e. there are two denticles or lobes connected by a complete crest), denoted 1c. Proximad there are some paired incomplete protrusions (i.e. protrusions lacking a complete crest), numbered 2, 3, n, from apex to base; these are either placed opposite to each other, a situation denoted n po, or shifted relative to each other, a situation denoted n ps. Near the tibial base the protrusions become single and/or obsolescent. In the descriptions given below a formula 1c—2ps—3ps—4 then means that from apex to base the outer side of the tibia is provided with one anteapical pair of protrusions connected by a crest, two pairs lacking a crest, in both cases the superior protrusions being shifted proximad, while, finally, there is a single protrusion near the tibial base. The protrusions 2 on the hind tibia (figs. 54, 55) are used for diagnostic purposes (see synoptic table, character 15).

The dentation of the fore tibia is described as a + b, in which a is the number of large distal denticles, b the number of smaller denticles, the size of which decreases proximad.

Lectotypes are selected if in the original description under a given species-group name at the same time: (1) no specimen is singled out as "type" (the type) or holotype; (2a) there are phrases from which it can be inferred that there was more



Figs. 2, 3. Approximate known distribution of *Bolbohamatum* species. Numbers refer to species as numbered in text. 2, species 1-8; 3, species 9-13. Numbers between square brackets refer to insufficiently detailed locality data.

than one specimen at hand; or (2b) there are no phrases from which it can be inferred that there was a single specimen at hand. This rigid formulation seems necessary because the practice of lectotype selection varies among taxonomists.

Most topographic names have been checked against those occurring in The Times Atlas of the World and the Gazetteers of the U.S. Board on Geographic Names. Places not located with a precision better than a hundred km are followed by an asterisk, and, if mapped, the symbol concerned is placed between square brackets. The spelling of topographic names as given on the labels is frequently maintained, in order to enable easy recognition of the specimens examined. The data of two old species have been condensed by separately giving localities, months, collections.

In the drawings the scale lines all represent 1 mm.

The collection abbreviations used are as follows:

- BH Zoologisches Museum der Humboldt-Universität, Berlin D.D.R.
 BM British Museum (Natural History), London.
 L Rijksmuseum van Natuurlijke Historie, Leiden.
 P Muséum National d'Histoire naturelle, Paris.
 SMT Staatliches Museum für Tierkunde, Dresden.

Other collections are mentioned in full.

Genus *Bolbohamatum* nov.

Generic diagnosis. — Metasternum with anterior lobe narrowly separating middle coxae, anteriorly always with a small spiniform protrusion (fig. 56), midline of lobe more or less raised; metasternal disc rhomboid in outline. Head of males with pair of tubercles on clypeus or between eye-canths (figs. 1, 9, etc.); frons of females (fig. 59) with transverse ridge; surface behind cephalic protrusions of males frequently impressed-callose. Pronotum of males with median and lateral protrusions (figs. 1, 9, 10, etc.); surface between paramedian and lateral protrusions usually concave; lateral tubercles in some cases obsolete; females with feeble protrusion(s) on anterior side of pronotal disc. Aedeagus usually strongly sclerotized, structure complex, including various accessory elements. Proximal surface on antennal club segment 1 with glabrous polished area (fig. 57). Pronotum entirely marginate, though base not always distinctly ridged.

Outline of left mandible in dorsal view variable, from simply arcuate to sinuate-lobate (figs. 51—53). Labrum with fine transverse ridge. Outline of clypeus (figs. 1, 9, etc.) approximately trapeziform, with distinct perimarginal ridge. Frontolateral ridge well pronounced. Eye-canthus (figs. 1, 9, etc.) with straight anterior border, anterolateral angle more or less angulate. Eyes not completely divided by canthus and temporal lobe. Dorsally visible area of eye-canthus usually little larger than area of eye-canthus. Scutellum deltoid (figs. 9, etc.), sides more or less sinuate; ratio length/width 1—2; base finely ridged. Apex of pronotum with narrow velum. Elytral base without well-defined ridge. Elytral epipleuron reaching apico-sutural angle. Elytron with 7 striae between suture and humeral umbone, 1 reaching side

of scutellum (figs. 9 etc.), stria 2 curved and more or less effaced near base; others reaching base; all striae (except stria 2 in two species) superficially impressed and interstriae flat or slightly convex. Antennal club large, but not thicker than length of pedicel and flagellar segments combined. Anterior paramedian costae of prosternum distinct. Posteromedian part of prosternum simply bulbous. Fore tibia with 7—10 external denticles, their size decreasing proximad. Fossorial elevations on middle and hind tibiae (figs. 54, 55) bidentate-bilobate, their size decreasing proximad. Fore tibial spur long, large, with acute apex. Habitus, fig. 1. Colour uniformly brown to yellow. Medium-sized to large (total length 13—23 mm).

Type-species. — *Scarabaeus cyclops* Olivier.

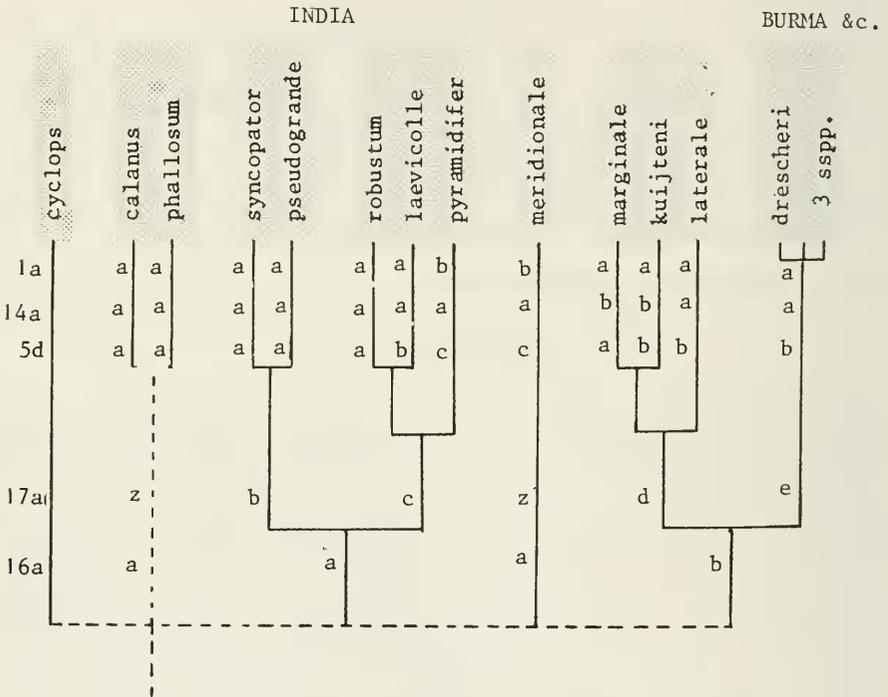


Fig. 4. Phylogenetic diagram summarizing the present classification of *Bolbohamatum*, as based on the stridulatory granules of the pygidium (character 16 in synoptic table, see text), the structure of the phallus (17), the pronotal protrusions (5), the disposition of the first elytral stria (14), and the shape of the cephalic tubercles (1). Letters denote character states; species-groups shaded. See also section Phylogeny in text.

Affinities. — The group around *Bolbohamatum validus* (Klug) (Krikken, 1978) seems closely affined to *Bolbohamatum* judged from the strong overall similarity in external characters. The metasternal spine, however, certainly is a unique differentiating character of *Bolbohamatum*. Furthermore, the males of the *Bolbohamatum validus* group are characterized by the presence of a simple transverse clypeal ridge, not connected with the margin, whereas *Bolbohamatum*

males always have a pair of isolated tubercles on either clypeus or the anterior part of the frons. The only representative of the *validus* group in the Oriental Region seems to be *Bolboceroides carinicollis* (Laporte), the other species being Arabian and Afrotropical.

Bolboceras Kirby, with which four *Bolbohamatum* species were combined up till now, is very remotely related to *Bolbohamatum*; *Bolboceras* is a, probably junior, synonym of *Odonteus* Samouelle (cf. Krikken, 1978: 301, footnote).

Distribution and composition. — Thirteen species in the Oriental Region, with transgression of one species into the Palaearctic Region (figs. 2, 3). Only two species occur outside India, one on Ceylon, the other ranging eastward from Burma to China and Java. The gap between Java and the continental range is also found in *Bolbelasmus* (Krikken, 1977a: 280). The records from Karachi and Taiwan need confirmation.

Infrageneric dissimilarities. — For the identification to species and subspecies it is crucial to study well-developed males. In case of doubt, the characters of the male genitalia are always decisive. On the whole, 17 characters (classified below) proved to have practical diagnostic value. In the key to the males the genital features (character 17) are used first to delimit species-groups, the external features coming second. Three of four species-groups thus delimited are assumed to be monophyletic, primarily because the structure of their aedeagus is unique. The three other groups contain only one species each. With the aid of the synoptic table of characters preceding the analytical key most *Bolbohamatum* males (those of *phallosum* and *calanus* excepted) should be identifiable on external characters. As stated above, in the introduction, the identification of females remains very difficult, and in some cases seems impossible. The key to *Bolbohamatum* females given below only provides some guide-lines. Under each species the specific characters are briefly re-discussed (in the paragraphs headed Identification).

Individual variation. — Most conspicuous is the reduction of pronotal protrusions and cavities, if this is not already a character of the species. The topography of these modifications, reduced or not, however, always remains essentially the same. Such reductions in shape, noticed in all the species available in good series, have not been described in detail under each species. One distinct case of geographic variation has been found (*B. drescheri*).

Bionomics. — Unknown; probably burrowers; collected at light.

Phylogeny. — Evolution in *Bolbohamatum* can, in my opinion, only be discussed if four points are accepted: (1) the genus is monophyletic; (2) in the structure of the phallus there is a trend towards greater complexity (character 17, see synoptic table and explanation); (3) a pronotal ornamentation like in *B. calanus* is plesiomorphous, any reductions and other modifications being, eo ipso, apomorphous (character 5); (4) some unusual character states (1b and 14b) are apomorphous. Complexity in the phallus is here understood as development of paramerites and other elements supplementary to a relatively simple structure like that in *B. calanus* (figs. 27, 28).

It could then be argued that *B. cyclops* is the most strongly derived member of the genus, standing isolated by its peculiar pronotal ornamentation and by its very

peculiarly modified phallus; it seems impossible to link this species with any of the others. The *pseudogrande* and *laevicolle* groups might be cladistic twins, because the ventral paramerites of the phallus seem homologous, whereas transitions from one type to the other can easily be imagined. The robust basal capsule of the phallus of *B. marginale*, in combination with its pronotal ornamentation, suggests a link between the *laterale* and *drescheri* groups. Both groups lack the row of stridulatory granules on the pygidium. The position of *B. meridionale* remains enigmatic considering its aedeagus, but that species is here placed near *pyramidifer* because of the similar cephalic and pronotal ornamentation. Finally, there are the apparently primitive *calanus* and *phallosom*, with a perfect external overall similarity, the latter, however, having a modified phallus.

These speculations, plus the known distribution of the species, are summarized in a phylogenetic diagram (fig. 4), which clearly shows with which "loose ends" we are left. The overall situation suggests that *Bolbohamatum* evolved on the Indian subcontinent, and spread in a relatively late stage (possibly after India reached Eurasia) through Burma into Sundaland and China. It is remarkable to see that the only species occurring East of the mountains on the Indian-Burmese border shows signs of subspeciation.

SYNOPTIC TABLE OF *Bolbohamatum* MALES

Characters	*1	2	3	4	*5	6	7	8	9	10	11	12	13	*14	15	*16	*17
	states																
1. <i>cyclops</i>	a	c	b	a	d	a	0	b	c	b	b	b	a—b	a	a	a	a
2. <i>calanus</i>	a	a	b	a	a	a	a	b	c	b	b	a	b	a	a	a	z
3. <i>phallosom</i>	a	a	b	a	a	a	a	b	c	b	b	a	b	a	a	a	z
4. <i>syncopator</i>	a	a	b	a	a	a	a	b	c	a—b	b	a	a	a	b	a	b
5. <i>pseudogrande</i>	a	b	b	a	a	a	a	b	c	b	b	b	b	a	a	a	b
6. <i>robustum</i>	a	a	b	a	a	a	a	b	c	b	b	b	a	a	b	a	c
7. <i>laevicolle</i>	a	a	a	b	b	a	a	a	b	a	b	b	a	a	a	a	c
8. <i>pyramidifer</i>	b	d	a	b	c	b	0	0	c	c	b	b	b	a	a	a	c
9. <i>meridionale</i>	b	d	a	a	c	b	(a)	(b)	c	c	b	b	b	a	b	a	z
10. <i>marginale</i>	a	c	a	a	a	a	a	b	c	a	a	b	b	a	b	a	d—e
11. <i>kuijteni</i>	a	c	a	a	b	a	b	b	c	a	a	a	b	b	a	b	d
12. <i>laterale</i>	a	c	a—b	a	b	b	b	0	c	c	b	b	a—b	a	a	b	d
13. <i>drescheri</i>	a	a/c	b	a	b	a	a/b	b	b	a	b	b	b	a	b	b	e

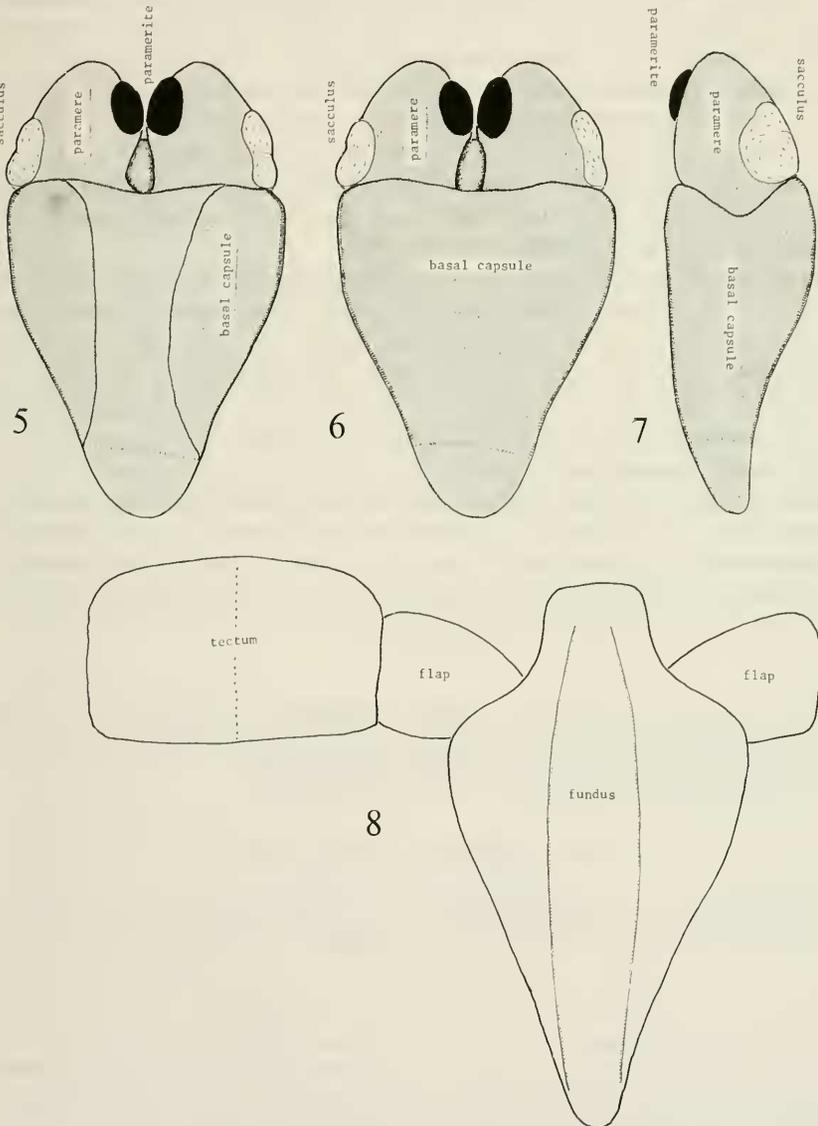
Explanation of characters and character states (see comparative illustrations):

- *1. cephalic tubercles more or less dentiform (a), pyramidiform (b).
2. cephalic tubercles isolated and placed simply on clypeal disc (a), together on an elevation (b), on or against lateral margin (c); placed between eye-canthi (d).
3. paraocular ridges straight (a), curved laterad along eye (b).
4. dorsal outline of left mandible sinuate-lobate (a), simply arcuate (b).
- *5. paramedian tubercles on pronotum placed close together on common

protrusion (a), well separated (b); paramedian tubercles poorly developed or absent (c); pronotum with large, laterally angulate median protrusion (d).

6. lateral tubercles of pronotum well developed (a), very poorly pronounced or absent (b).

7. (related with 5:) paramedian tubercles on pronotum separated by less than/equal to interocular distance (a), separated by more than interocular distance (b).



Figs. 5—8. Some terms relating to male genitalia. 5—7, diagram of phallus, dorsal (5), ventral (6), and lateral views (7); 8, sagulum, unfolded. Paramerites black (also in figs. 25—41).

8. (related with 6:) lateral tubercles on pronotum separated by less than/equal to distance between anterolateral angles (a), separated by more than distance between anterolateral angles of pronotum (b).
9. (related with 5:) median cavity of pronotal disc deep, very distinct (a), shallow (b), obsolescent or absent (c).
10. lateral impression of pronotum (adjacent to (para)median protrusion(s)) deep, very distinct (a), shallow (b), obsolescent or absent (c).
11. primary punctation of pronotal disc behind (para)median protrusion(s) sparse (punctures separated by more than 5 times their diameters) or indistinct ($\times 25$) (a); primary punctation abundant or dense (b).
12. secondary punctation of pronotal disc sparse (punctures separated by more than 5 times their diameter) (a), abundant or dense (b).
13. elytra distinctly opaque, due to microreticulation (a), shiny (b).
- *14. elytral stria 1 scarcely, virtually equally impressed over its entire length, and equally punctate over its entire length (a); stria 1 distally more strongly impressed and more strongly punctate (b).
15. distal pair of unconnected protrusions on (right) hind tibia placed more or less opposite to each other, 2po (a), superior protrusion distinctly shifted proximad, 2ps (b).
- *16. pygidium with distinct transverse row of stridulatory granules at some distance from apex, elytral file distinct (a); "stridulatory" (strongly infuscated) granules scattered near apex, not transversely arranged, elytral file poorly developed or absent (b)¹).
- *17. phallus of: *cyclops* type, with spatuliform protrusions (a); *pseudogrande* type, with sledge- or collar-like paramerites (b); *laevicolle* type, with crossed paramerites (c); *laterale* type, with short, simply reflexed paramerites (d); *drescheri* type, with reduced parameres and enlarged basal capsule (e); different from preceding alternatives (z).

Between parentheses (in table above): character state poorly pronounced; oblique dash: both states occur (subspecies); dash: transitional state occurs; zero: not applicable; asterisk: used for phylogenetic discussion.

KEY TO SPECIES OF *Bolbohamatum*²)

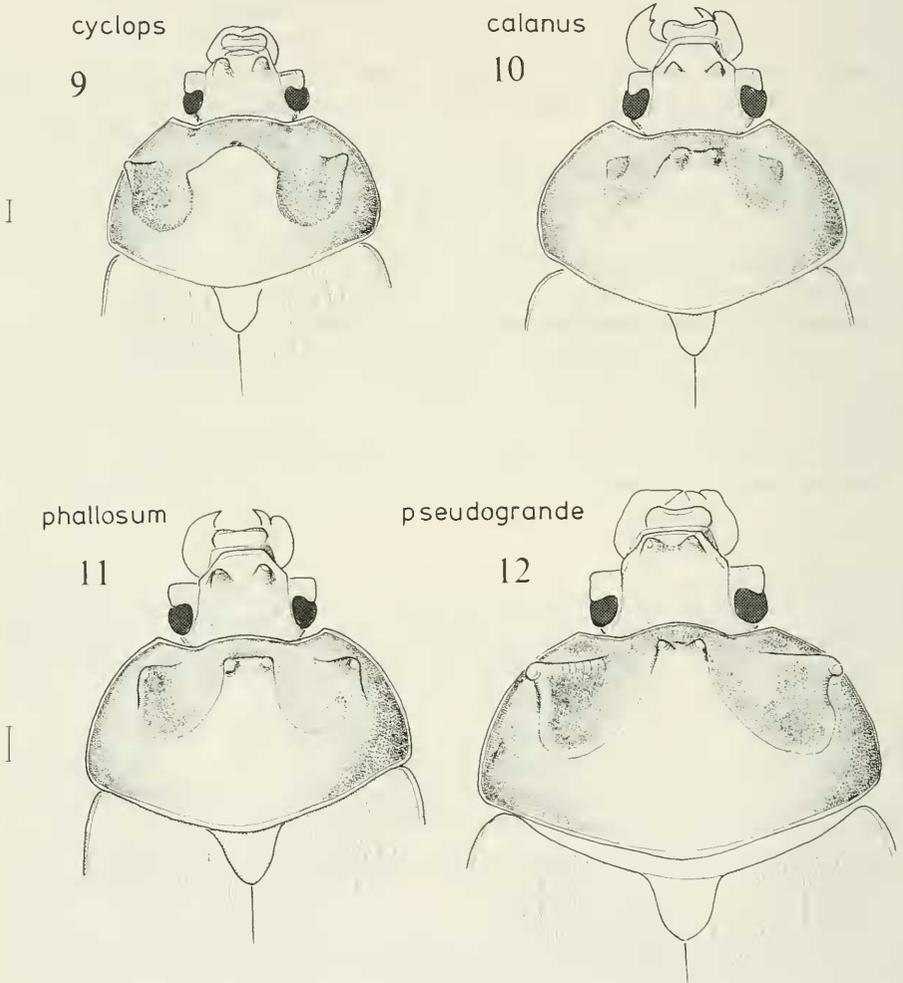
1. Males, with pair of protrusions between eye-canths or on clypeus 2
- Females, with transverse frontal ridge, no pair of isolated tubercles; pronotal

¹) Whereas the stridulatory capacities of state (b) remain doubtful, those of (a) can be demonstrated clearly by gently rubbing the abdomen (after relaxation) in its natural position against the elytral tips. The elytral file is a series of closely arranged fine transverse ridges (distinct at $\times 50$ and more) on the juxtastatural costa on the inside of the elytral tips. In the *laterale* group of species the elytral files seem fully effaced (magnification $\times 50$), in *drescheri* they are small but distinct.

²) For more characters, see synoptic table, and paragraphs under each species headed Identification.

- ornamentation poorly developed. TENTATIVE KEY; names between square brackets: actual females unknown, characters established by inference . . . 15
2. Basal capsule of phallus ventrally with paired spatuliform projection (fig. 26); aedeagus with similar projection and other characteristic details. Pronotum with broad, mostly laterally angulate protrusion (fig. 9). *B. cyclops* group 1. *cyclops*
 — Phallus different 3
 3. Aedeagus ventrally with pair of crossed spatuliform paramerites (figs. 35—37). *B. laevicolle* group 10
 — Aedeagus different 4
 4. Apex of parameres dorsally with short reflexed paramerites (figs. 38—40) (check carefully in case penis is extruded). *B. laterale* group 12
 — Parameres different 5
 5. Parameres and other parts of aedeagus relatively small, usually largely hidden in the greatly enlarged basal capsule of the phallus (fig. 41). *B. drescheri* group 13. *drescheri*, with subspecies, 14
 — Parameres and basal capsule different. If similar, then elytral stria 1 distally more strongly impressed and more strongly punctate, see 12 6
 6. Aedeagus ventrally with sledge- or collar-like, laterally reflexed paramerites (figs. 31, 33). *B. pseudogrande* group 9
 — Aedeagus different 7
 7. Cephalic tubercles pyramidiform (fig. 17). Paramedian tubercles on pronotum poorly developed or absent (fig. 17), other protrusions and impressions ditto. Fossorial elevations 2p on hind tibiae shifted. Aedeagus, fig. 32. *B. meridionale* group 9. *meridionale*
 — Cephalic tubercles dentiform (figs. 10, 11) and aedeagus different. Pronotal protrusions usually well-developed (figs. 10, 11). Fossorial elevations 2p on hind tibiae (sub)opposite. *B. calanus* group 8
 8. Aedeagus, figs. 27, 28 2. *calanus*
 — Aedeagus, figs. 29, 30 3. *phallosom*
 9. Clypeal tubercles connected at base (fig. 12). Fossorial elevations 2p on hind tibiae opposite (fig. 54). Aedeagus, fig. 31 5. *pseudogrande*
 — Clypeal tubercles simply separated (fig. 14). Fossorial elevations 2p on hind tibiae shifted. Aedeagus, figs. 33, 34 4. *syncopator*
 10. Protrusions between eye-canthi pyramidiform (fig. 16). Pronotal ornamentation poorly developed (fig. 16). Aedeagus, fig. 37 8. *pyramidifer*
 — Protrusions on clypeus more or less dentiform (figs. 13, 15). Pronotal ornamentation usually well developed 11
 11. Paramedian tubercles of pronotum closely approximated (fig. 13). Dorsal outline of left mandible sinuate-lobate (fig. 52). Elevations 2p on hind tibiae shifted (fig. 55). Aedeagus, fig. 36 6. *robustum*
 — Paramedian tubercles of pronotum separated by distinct impression (fig. 15). Dorsal outline of left mandible simply arcuate (fig. 51). Elevations 2p on hind tibiae opposite. Aedeagus, figs. 35 7. *laevicolle*
 12. Elytral stria 1 virtually equally impressed and equally punctate over the entire

- length. Pronotal disc heavily punctate. Elytra subopaque. Clypeal tubercles transverse, low. Aedeagus, fig. 38 12. *laterale*
- Elytral stria 1 distally more strongly impressed and more strongly punctate than proximally. Pronotal disc lightly punctate. Elytra shiny. Clypeal tubercles dentiform, high 13
13. Paramedian tubercles of pronotum closely approximated, lateral impressions usually deep, well defined (fig. 20). Phallus (fig. 40) with enlarged basal capsule 10. *marginale*
- Paramedian tubercles of pronotum widely separated, lateral impressions shallow, ill defined (fig. 19). Aedeagus, fig. 39 11. *kuijteni*

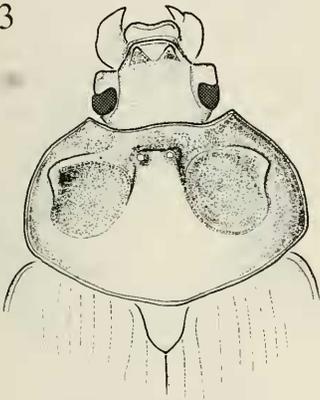


Figs. 9—12. *Bolbohamatum* males; dorsal contours of fore-body. 9, *cyclops*, Nepal; 10, *calanus*, Sylhet; 11, *phallosum*, holotype; 12, *pseudogrande*, holotype. — 10—12, same scale.

14. Occurring on Java. Ratio distance tips of paramedian pronotal cones/distance anterolateral angles less than 0.5; axes of cones inclined to midline (fig. 24) 13a. *drescheri drescheri*
- Occurring in Burma and Laos. Ratio distance tips of paramedian pronotal cones/distance anterolateral angles more than 0.6; axes of cones upright or inclined laterad (fig. 22) 13c. *drescheri birmanicum*
- Occurring in Indo-China and China. Ratio variable, in Indo-China usually ca. 0.5; axes of paramedian pronotal cones usually upright (fig. 23). Populations of Vietnam and Cambodia here named 13b. *drescheri indosinicum*

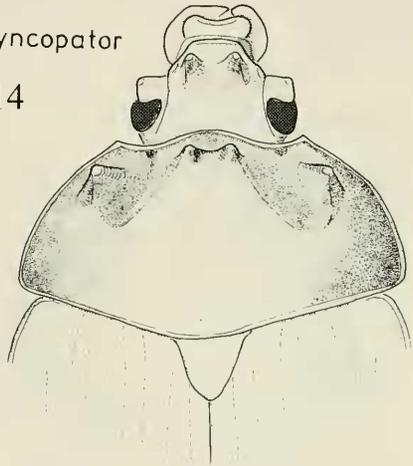
robustum

13



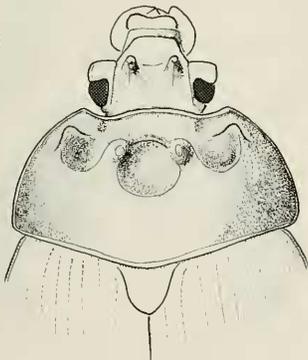
syncopator

14



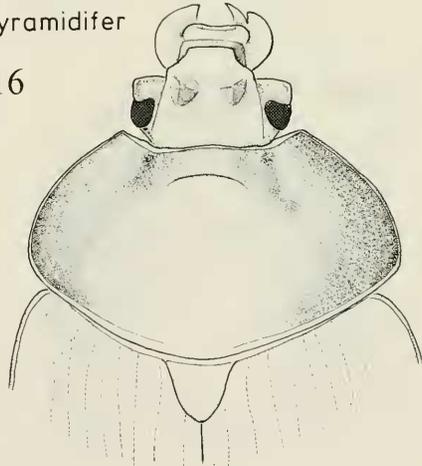
laevicolle

15



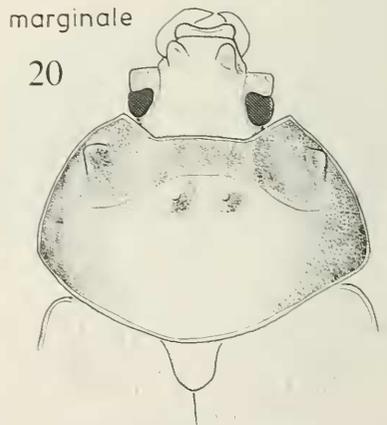
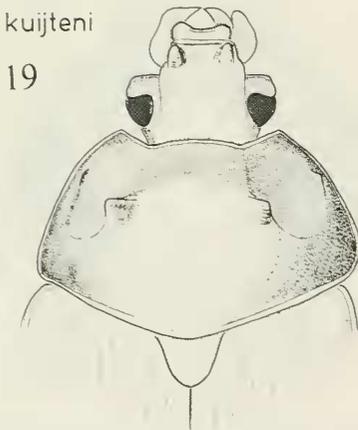
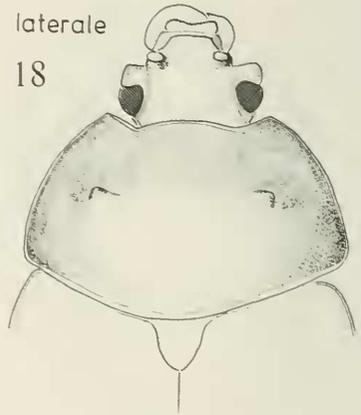
pyramidifer

16

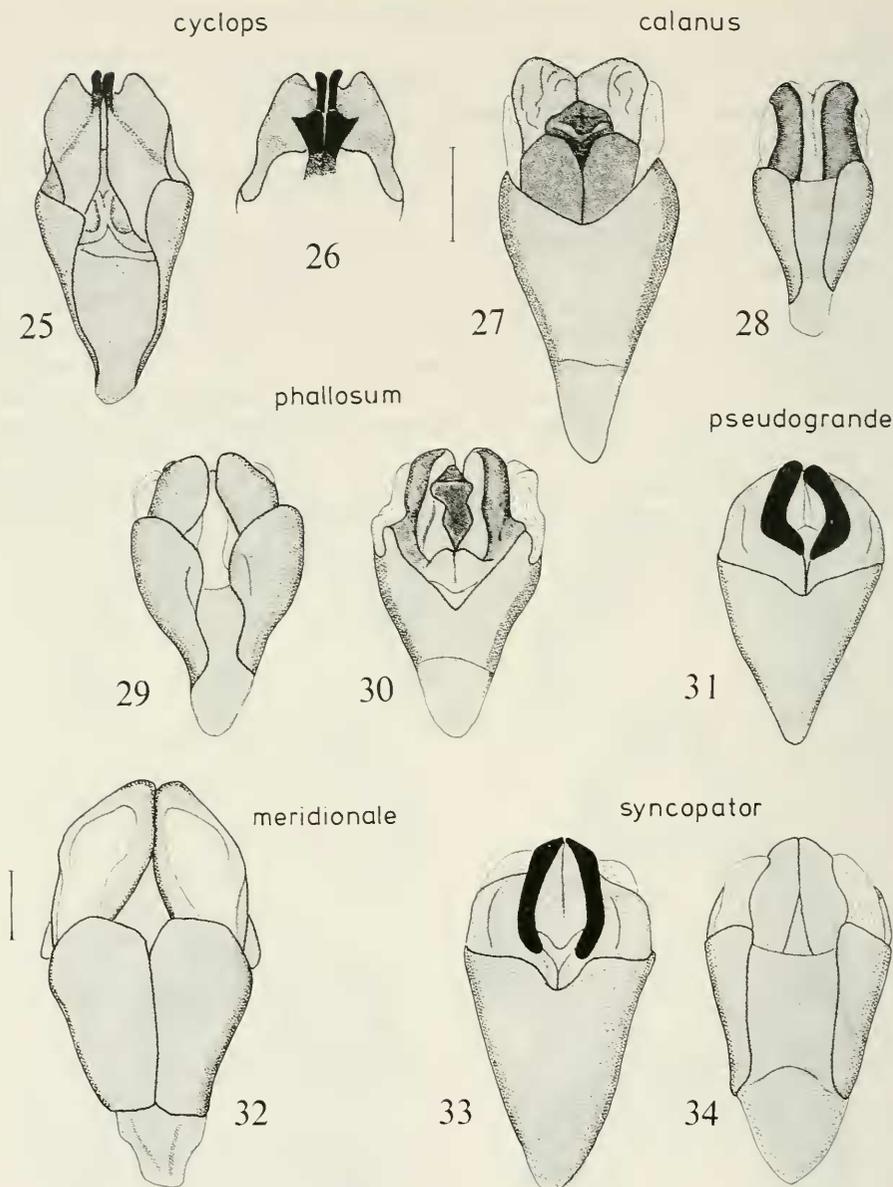


Figs. 13—16. *Bolbohamatum* males; dorsal contours of fore-body. 13, *robustum*, holotype; 14, *syncopator*, holotype; 15, *laevicolle*, Bombay; 16, *pyramidifer*, holotype. — 13, 15, same scale; 14, 16, same scale.

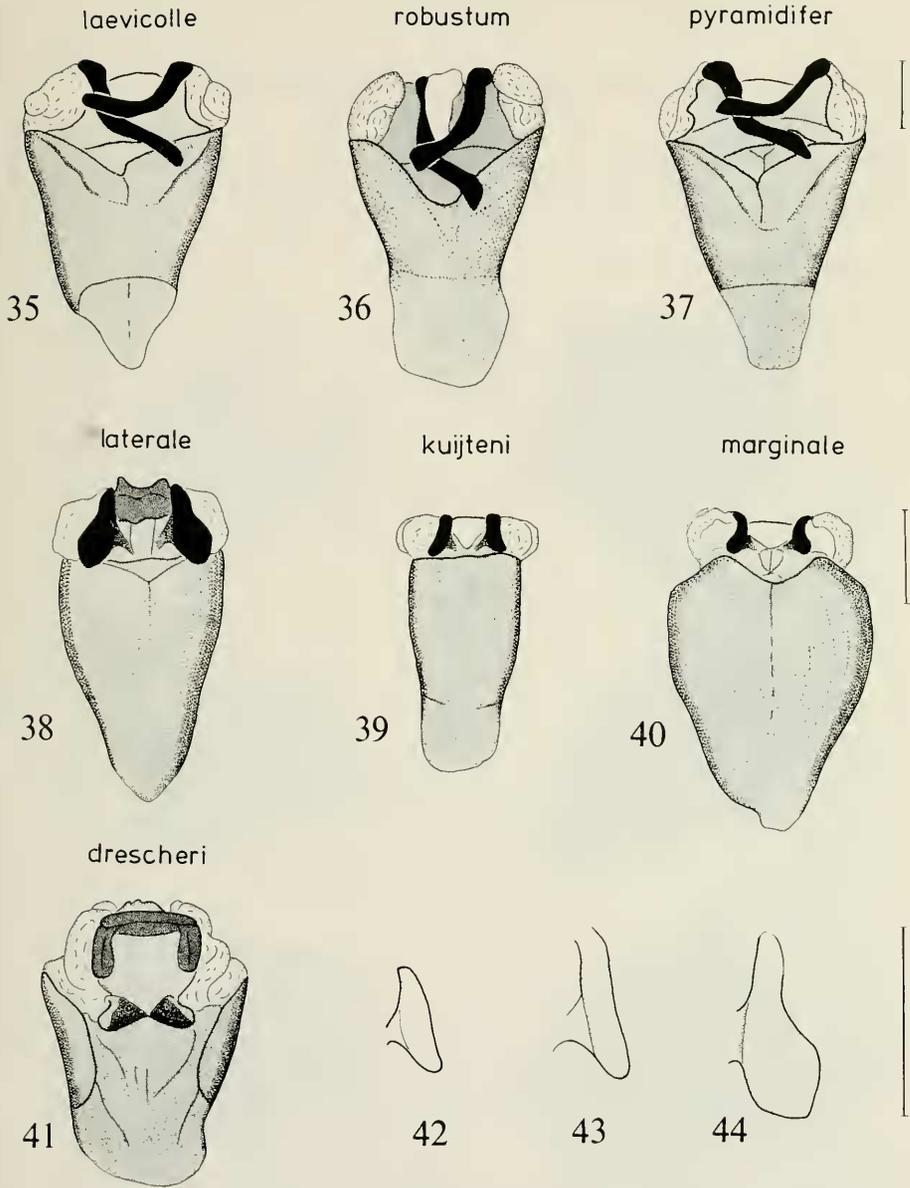
- 15. Occurring on Java 13a. *drescheri drescheri*
- Occurring in Indo-China 13b. *drescheri indosinicum*
- Occurring in India, Sri Lanka, Burma, Laos, China etc. 16
- 16. Elytral stria 1 distally more strongly impressed and more strongly punctate than proximally 10. *marginale*, [11. *kuijteni*]
- Elytral stria 1 virtually equally impressed and equally punctate over the entire length 17
- 17. Pronotum and head heavily punctate. Anteromedian ridge on pronotal disc simply arcuate (fig. 59). Dorsal outline of left mandible sinuate-lobate 1. *cyclops*
- Pronotum and head less heavily punctate; or not agreeing with the other two characters 18



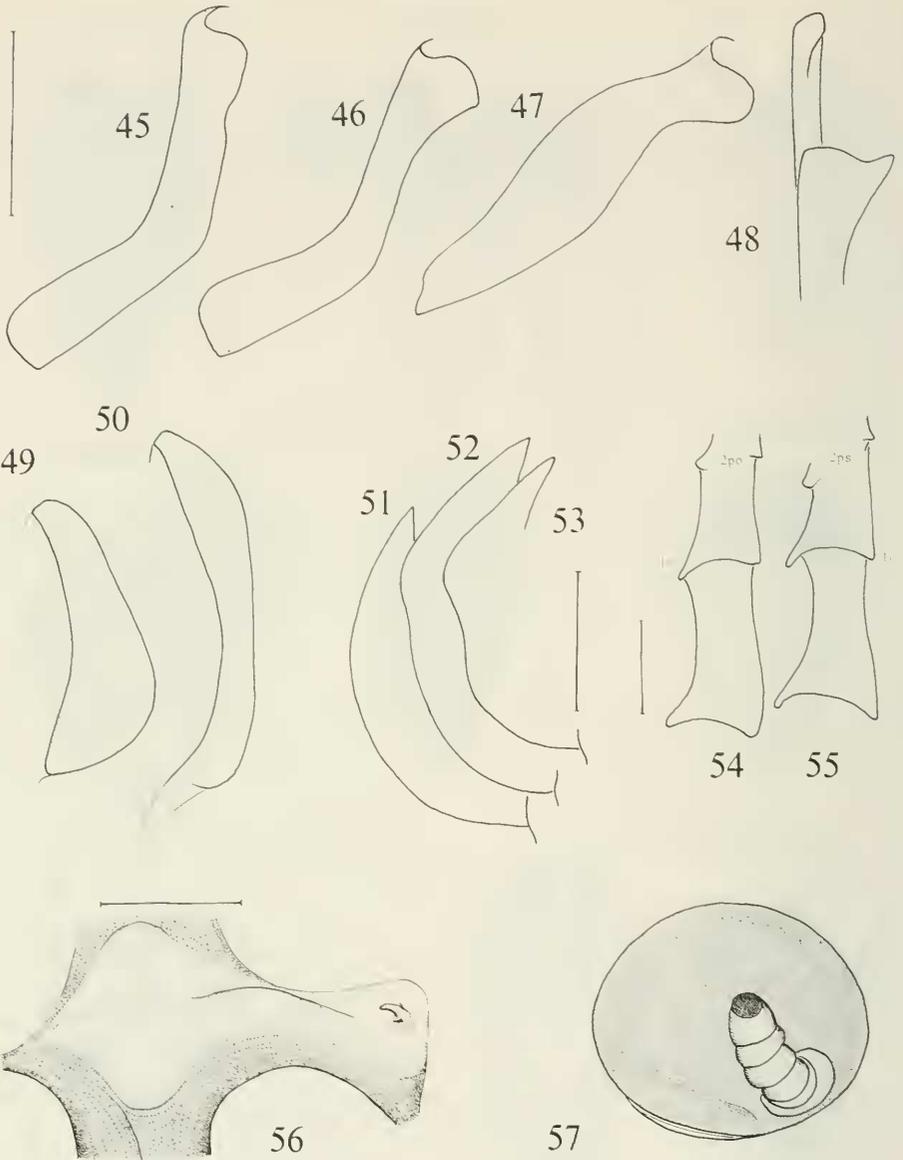
Figs. 17—20. *Bolbohamatum* males; dorsal contours of fore-body. 17, *meridionale*, holotype; 18, *laterale*, Nagpur; 19, *kuijteni*, holotype; 20, *marginale*, holotype. — All same scale.



Figs. 25—34. Male genitalia of *Bolbohamatum* (d, dorsal, v, ventral view). 25, *cyclops*, d, 26, v, apex only, Dehra Dun; 27, *calanus*, v, 28, d, Sylhet; 29, *phallosum*, d, 30, v, holotype; 31, *pseudogrande*, v, holotype; 32, *meridionale*, d, holotype; 33, *syncopator*, v, 34, d, holotype. — Same scale, except 27.



Figs. 35—41. Male genitalia of *Bolbohamatum* (35—40, ventral, 41, dorsal view). 35, *laevicolle*, Bombay; 36, *robustum*, holotype; 37, *pyramidifer*, holotype; 38, *laterale*, Nagpur; 39, *kujitani*, holotype; 40, *marginale*, holotype; 41, *drescheri drescheri*, Bandung. — 35—37, 41, same scale; 38—40, same scale. Figs. 42—44. Ventral paramerites (left) enlarged, full-face. 42, *kujitani*; 43, *marginale*; 44, *laterale*. All same scale.



Figs. 45—50. Ventral paramerite (left) enlarged, full-face. 45, *robustum*; 46, *pyramidifer*; 47, *laevicolle*; 48, *cyclops*; 49, *pseudogrande*; 50, *syncopator*. All same scale.

Figs. 51—53. Contours of left mandible. 51, *laevicolle*, Bombay; 52, *robustum*, holotype; 53, *kuijteni*, holotype. Alle same scale.

Figs. 54—55. Distal-external section of middle tibia to show disposition of protrusions 2p. 54, *pseudogrande*, holotype, with situation 2po = paired protrusions (no. 2) opposite; 55, *robustum*, holotype, with situation 2ps = paired protrusions shifted. 1c = complete anteapical crest (no. 1). See under Technical remarks.

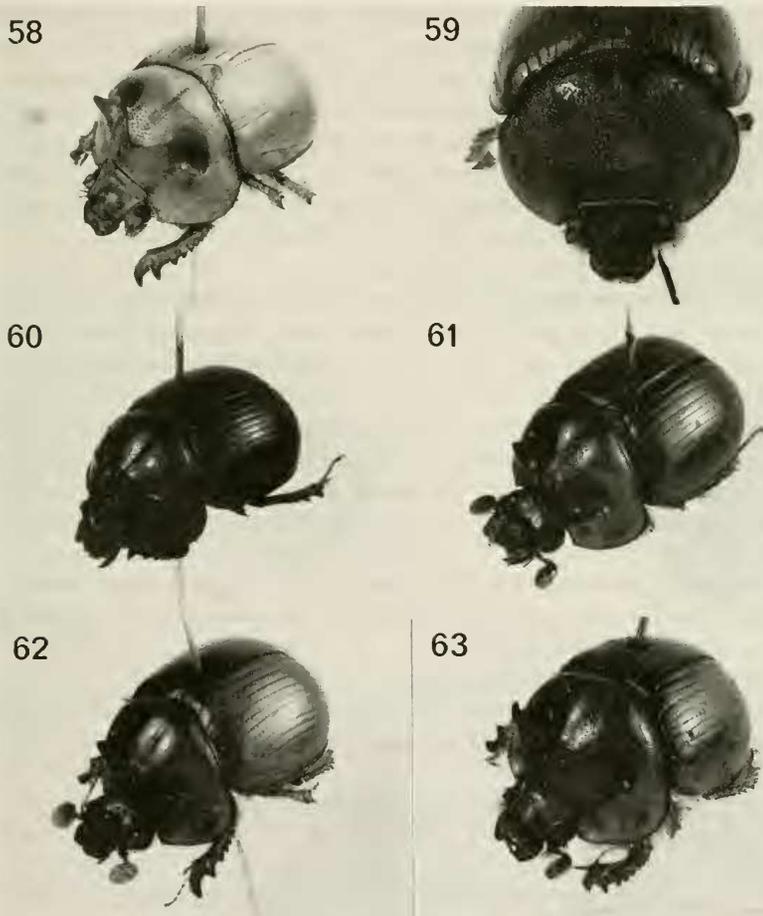
Fig. 56. Metasternal disc and hook-bearing anterior lobe, ventrolateral view, of *Bolbohamatum drescheri drescheri* holotype. Fig. 57. Antennal club, view of club segment 1, with some proximal (flagellar) segments (*B. pseudogrande*).

The *cyclops* group1. *Bolbohamatum cyclops* (Olivier) comb. nov.
(figs. 9, 25, 26, 48, 58, 59)

Scarabaeus cyclops Olivier, 1789: 60 (diagnosis, no type-loc. given), pl. 15 fig. 140 (habitus). Westwood, 1848a: 384 (*Bolboceras*, diagnosis, records)¹⁾; 1852: 19 (diagnosis, records), pl. 3 fig. 15 (habitus).

Scarabaeus veter Fabricius, 1792: 33 (diagnosis, type-loc. East India). Boucomont, 1912: 14 (*Bolboceras*, in catalogue). Syn. nov.

Bolboceras subglobosus Westwood, 1852 (diagnosis, type-loc. East India), pl. 4 fig. 4 (fore-body). Syn. nov.



Figs. 58—63. *Bolbohamatum* males, except 59, female. 58, *cyclops*, Nepal, 18.5 mm; 59, *cyclops*, Pusa, 15 mm; 60, *calanus*, Sylhet, 16 mm; 61, *phallosum*, holotype, 18 mm; 62, *syncopator*, holotype, 19.5 mm; 63, *pseudogrande*, holotype, 20.5 mm.

¹⁾ The text of Westwood, 1848b, is identical.

Identification. — *Bolbohamatum cyclops* males are easily identifiable by the characteristic median protrusion on the pronotum. The phallus has a unique structure. In both sexes the pronotum is heavily punctate. For characters of female, see below.

Note. — The name *cyclops* has been applied to some of the other species, e.g. to *drescheri drescheri*, because allegedly some material came from Java (see labels of lectotype). It seems very unlikely that *B. cyclops* occurs on that island, or elsewhere outside India.

Variation and sexual dimorphism. — Length ♂ 17–19, ♀ 17–19 mm. The median protrusion on the pronotum is simply arcuate in smaller males, whereas the lateral cavities and adjacent denticles may be reduced as well. The density of the cephalic punctuation varies strongly.

Females are characterized by a very distinct, feebly arcuate transverse ridge between the obsolescent lateral callosities. The entire pronotum, except for a small area near the base, is crowded with a well-pronounced double punctuation. On these characters I have here synonymized *Bolboceras veter* (Fabricius) and *Bolboceras subglobosum* Westwood, both based on the female sex, with *Bolbohamatum cyclops*, the oldest available name for this species.

Material examined. — 22 males, 14 females.

The male lectotype of *Scarabaeus Cyclops* Olivier, here designated, with labels reading "Java" (sic), "cyclops", "type" (in red circle), "Cyclops Fab./Lees Cabt", and a recent Oxford type label "Type COL: 511/Bolboceras/cyclops Oliv./Hope Dept. Oxford". The female lectotype of *Scarabaeus Veter* Fabricius, here designated, bearing a red type label, and a label reading "Ind: orient: Vahl./Mus. S. & T: L:/Cyclops./Oliv./Geotrupes/veter. F." (Zoologiske Museum, Copenhagen). A female from the Hope Dept. of Entomology, apparently the holotype of *Bolboceras subglobosum* Westwood. And material from the following localities, months, collections:

India: Balaghat; Calcutta; Chapra; Dehra Dun; Moghal Sarai; New Delhi; Pusa; Simla; Sitapur (W. Almora); Suruwal*; N. India; N.W. India; Nepal; Himalaya. — Java (mislabelled).

Months vii (7 specimens), viii (2), ix (2), x (2).

Collections BM, P, SMT, Institut Royale des Sciences naturelles de Belgique, Zoologiske Museum (Copenhagen), Bernice P. Bishop Museum.

The *calanus* group

2. *Bolbohamatum calanus* (Westwood) comb. nov.

(figs. 10, 27, 28, 60)

Bolboceras calanus Westwood, 1848a: 385 (diagnosis, type-loc. Bombay); 1852: 21 (diagnosis, ♂, ? ♀), pl. 3 figs. 19 (habitus), 19a (fore-body), 19b (detail), pl. 4 fig. 6 (fore-body, ? ♀).

Bolboceras tumidulus Westwood, 1852: 22 (diagnosis, type-loc. Borhendshukur), pl. 4 fig. 7a, b (fore-body).

Identification. — Only the characters of the phallus distinguish *Bolbohamatum*

calanus from its relative *phallosum*. The parameres of *calanus* have dorsally a moderately sclerotized, relatively narrow, on the whole poorly developed paramerite; the ventral side of the parameres is devoid of distinct paramerites. For further characters, see under *B. phallosum*.

Notes. — Other *Bolbohamatum* species have frequently been identified as *calanus* Westwood because of their similar pronotal ornamentation. I have not recovered all the specimens on which Paulian (1945: 41) based his *calanus* records for Indo-China, but certainly some of these, if not all, pertain to *B. drescheri*. Paulian's description seems based on *drescheri*, as the paramedian tubercles of the pronotum are said to be separated by a rounded foveole. The specimen figured by Paulian (1945: fig. 25) may, however, indeed belong to *calanus*.

Variation and sexual dimorphism. — Length ♂ ♀ 14—18 mm.

A large number of females remain which, judged from the non-sexual characters and size, may belong to *calanus* and *phallosum*. Usually their pronotum has a pair of feebly developed, slightly transverse median tubercles and an indication of lateral callosities. The pronotum is abundantly punctate, but never densely punctate throughout. From the females of the *laterale* group they can be separated by their transverse pygidial row of stridulatory granules, and from *marginale* (and *kuijteni*) by their different elytral stria 1. All the females belonging to either *calanus* or *phallosum* that could not be associated with males on the basis of their labels are recorded below as dubious *Bolbohamatum* specimens.

Material examined. — 40 males, 10 females.

Male lectotype, here designated, from "India/Boys Sale", also with label "calanus Hope", abdomen missing! Another male "type" in the Hope Dept. of Entomology, Oxford, is labelled "Madras/Hope", "Calanus/Hope", but that locality was not mentioned by Westwood (1848a: 385); I extracted the phallus of this male, and found it to agree with my original interpretation of *calanus*. In the BM I saw the holotype of *Bolboceras tumidulus* Westwood, apparently a female of either *calanus* or *phallosum*. Further material from the following localities, months, collections:

India: Balasore; Bangalore; Belgaum; Burju* (Bengal); Chickaballapura; Chota Nagpore; Dallongunj* (Bengal); Dehra Dun; Kanara; Madras; Moiyana*; Motinala R.; Mughal Sarai; Namrum* (Bihar); Shimoga; Surada; Tranquebar; Vellore; Assam; Himalaya; Hindustan; Bangla Desh: Sylhet. — Java (mislabelled!?).

Months v, vii-viii (only 7 specimens had dates).

Collections BH, BM, DEI, P, SMT, Zoologiske Museum (Copenhagen), Forest Research Institute (Dehra Dun), Hope Dept. of Entomology, Senckenberg-Museum, Zoological Survey of India (Calcutta).

3. *Bolbohamatum phallosum* sp. nov.

(figs. 11, 29, 30, 61)

Holotype (male). — Approximate length 18, width 10.5, height 8 mm. Medium-brown, shiny; pilosity yellow-brown. Habitus, fig. 61.

Labrum emarginate in front, sides rounded; surface anteriorly limited by transverse ridge. Cephalic contours, fig. 11. Clypeus with pair of dentiform tubercles; clypeal margin ridged, genae raised; marginal declivities rugulate-punctate, horizontal surface contiguously punctate to rugulate-punctate; clypeofrontal suture effaced. Frontal disc concave; posterior cushion indistinct; entire frontovertex densely, but vaguely punctate. Eye-canthus rugulate-punctate; frontolateral ridge extending from genae beyond eye.

Pronotal contours, fig. 11; midline of pronotum impressed; base marginate; surface behind eyes slightly concave; pronotal punctation double ($\times 25$); primary punctation coarse, dense on midline impression, on lateral declivities and along marginal ridges, absent on disc at some distance from base, in lateral cavities and on tubercles; secondary punctation abundant. Scutellum (fig. 11) subopaque, due to microreticulation, indistinctly punctate.

Juxtasutural punctures of elytra subobsolete; discal striae shallowly impressed, finely punctate; punctures separated by 5 ± 2 times their diameters; peripunctural impressions ill pronounced, slightly affecting interstriae. Elytral interstriae very slightly convex; derm subopaque, due to microreticulation ($\times 50$); punctation minute, sparse.

Phallus figs. 29, 30.

Fore tibia with $2 + 5$ external denticles. Middle and hind tibiae with setose fossorial elevations, proximally reduced to pairs of denticles; number of non-apical elevations on right middle tibia $1c-2po-3ps-4$, on right hind tibia $1c-2po/s-3ps-4ps$; complete anteapical crest bidentate. Stridulatory granules on pygidium arranged in transverse row.

Some measurements in mm. Cephalic maximum length (exclusive of labrum and mandibles) 2.6, maximum width 4.4; distance tips of clypeal tubercles 1.5. Distance anterolateral angles of pronotum 5.0, tips paramedian tubercles 1.2, lateral tubercles 6.3; median length 5.6, maximum width 9.9. Median length of scutellum 1.5, maximum width 1.8. Number of primary punctures on pronotal disc behind paramedian tubercles $6-7/0.25$ sq. mm, their diameters 0.10-0.15 mm.

Variation and sexual dimorphism. — Length σ 16-18 mm. There is some variation in the development of cephalic and pronotal protrusions.

Females of this species probably go unrecognized in the material recorded further below as dubious specimens.

Identification. — *Bolbohamatum phallosum* and *calanus* differ from the other species by the following combination of characters. Males with closely approximated paramedian tubercles on the pronotum, lateral protrusions not shifted to anterolateral corner; clypeal tubercles dentiform. Elytra shiny. Protrusions 2p on hind tibia more or less opposite to each other. Stridulatory granules on pygidium arranged in transverse row. *B. calanus* and *phallosum* cannot be separated on external characters, but the phalli of both species are very different. Dorsally the parameres of *phallosum* are foliate; ventrally there is a pair of more or less glider-like paramerites; the basal capsule is in lateral view distally strongly emarginate.

Material examined. — 9 males.

Holotype from India: Bombay (Institut Royal des Sciences naturelles de Belgique, Brussels). Paratypes as follows:

India: Belgaum (1 ♂, BM); Bombay (1 ♂, P); ditto, Fontanier (2 ♂, P); East India (1 ♂, BM); East India no "962" (1 ♂, Senckenberg-Museum); India (1 ♂, BM). No data (1 ♂, P).

The *pseudogrande* group

4. *Bolbohamatum pseudogrande* sp. nov.

(figs. 12, 31, 49, 54, 57, 63)

Holotype (male). — Approximate length 20.5, width 13.5, height 9 mm. Medium-brown, moderately shiny; pilosity yellow-brown. Habitus, fig. 63.

Labrum emarginate in front, sides rounded; surface anteriorly limited by arcuate ridge. Dorsal outline of left mandible lobate. Cephalic contours, fig. 12. Clypeus with pair of clypeal tubercles more or less connected at base; clypeal margin ridged, genae raised; marginal declivities steep, rugulate-punctate; horizontal surface rugulate-punctate; clypeofrontal suture effaced. Frons with transversely confluent punctures in front, irregularly punctate behind; posterior cushion ill pronounced. Eye-canthus rugulate-punctate; frontolateral ridge strongly pronounced, slightly curved outwards caudad, extending beyond eye.

Pronotal contours, fig. 12. Midline of pronotum slightly impressed; base marginate; pronotum with closely set subtransverse paramedian tubercles, on each side separated from high lateral tooth by deep cavity; anterolateral corner distinctly concave. Pronotal derm with distinct double punctation; primary punctation coarse, crowded laterally, contiguous along margin, sparse or absent in anterolateral corner, finer, crowded on anterior declivity just in front of lateral cavities, secondary punctation ($\times 12$) abundant, evenly distributed. Scutellum (fig. 12) vaguely, crowdedly punctate.

Juxtasutural punctures obsolete ($\times 50$); discal striae shallowly impressed, finely punctate; punctures separated by 6 ± 2 times their diameters; peripunctural impressions ill pronounced, slightly affecting interstriae. Elytral interstriae scarcely convex, sparsely, vaguely, minutely punctate ($\times 50$) and microreticulate ($\times 50$).

Phallus, fig. 31.

Fore tibia with 2 + 6 external denticles. Middle and hind tibiae with setose fossorial elevations, proximally reduced to (pairs of) denticles; number of elevations on right middle tibia 1c—2ps—3ps—4—5, on right hind tibia 1c—2po—3ps—4ps; complete anteapical crests bidentate, with moderately long setae. Stridulatory granules on pygidium arranged in transverse row.

Some measurements in mm. Cephalic maximum length (exclusive of labrum and mandibles) 3.5, maximum width 5.3; distance tips clypeal tubercles 1.4. Distance anterolateral angles of pronotum 5.8, tips of paramedian tubercles 1.2, tips of lateral teeth 9.1; median length 7.0, maximum width 12.0. Median length of scutellum 1.7, maximum width 2.3. Number of primary punctures on median

protrusion of pronotum 15—20/sq. mm, their diameters 0.08 mm and less.

Female sex unknown.

Variation. — The paratype male is 21.5 mm long.

Identification. — *Bolbohamatum pseudogrande* is a large species, very similar to *syncopator*, *phallosum*, *calanus*, and *robustum*. Especially *robustum* can easily be confounded with *pseudogrande*, but the males of the latter have the clypeal tubercles somewhat connected at their base, whereas the protrusions 2p on the hind tibia are placed opposite to each other. Further external features characterizing *B. pseudogrande* include: Scutellum punctate. Lateral protrusions of pronotum high, not situated marginally; pronotal cavities very deep. Shape of ventral paramerites characteristic. This diagnostic information is rather tentative considering the fact that only two males are at hand.

Material examined. — Holotype from India: Kangra Valley, vii.1899, Dudgeon, 4500 ft (Howden collection). Male paratype from Assam (BM).

5. *Bolbohamatum syncopator* sp. nov.

(figs. 14, 33, 34, 62)

Holotype (male). — Approximate length 19.5, width 12.5, height 9.5 mm. Medium brown, moderately shiny; pilosity yellow-brown. Habitus, fig. 62.

Labrum distinctly emarginate in front, sides rounded; surface anteriorly limited by arcuate ridge. Dorsal outline of left mandible lobate. Cephalic contours, fig. 14. Clypeus with pair of dentiform tubercles; clypeal margin ridged, genae raised; marginal declivities low, rugulate-punctate; horizontal surface rugulate-punctate; clypeofrontal suture effaced. Frontal disc slightly depressed, posteriorly limited by pair of transverse callosities; derm densely punctate. Eye-canthus rugulate-punctate; frontolateral ridge strongly pronounced, slightly curved outwards caudad, extending beyond eye.

Pronotal contours, fig. 14. Midline of pronotum slightly impressed; base marginate; pronotum with paramedian and lateral tubercles, surface between paramedian and lateral tubercles, shallowly impressed; anterolateral corner shallowly impressed. Pronotal derm with distinct double punctation; primary punctures very dense on impressed midline between paramedian and lateral tubercles; rugulate-punctate on lateral declivities and along marginal ridge; secondary punctation ($\times 12$) very abundant, evenly distributed. Scutellum (fig. 14) vaguely rugulate-punctate.

Juxtasatural punctures of elytra obsolete ($\times 50$); discal striae shallowly impressed, finely punctate; punctures separated by 8 ± 3 times their diameters; peripunctural impressions ill pronounced, scarcely affecting interstriae. Elytral interstriae scarcely convex, densely minutely punctate ($\times 25$) and microreticulate ($\times 50$).

Phallus, figs. 33, 34.

Fore tibia with 2 + 6 external denticles. Middle and hind tibiae with setose fossorial elevations, proximally reduced to pairs of denticles; number of elevations on right middle tibia 1c—2ps—3ps—4ps, on right hind tibia 1c—2ps—3ps—4ps;

complete antepical crests bidentate, with setae of varying length. Stridulatory granules on pygidium arranged in transverse row.

Some measurements in mm. Cephalic maximum length (exclusive of labrum and mandibles) 2.9, maximum width 5.0, distance tips of clypeal tubercles 2.0. Distance anterolateral angles of pronotum 6.0, tips of paramedian tubercles 1.3, lateral teeth 7.3; median length 6.6, maximum width 10.9. Median length of scutellum 1.6, maximum width 2.2. Number of primary punctures behind pronotal impressions 5—10/0.25 sq. mm, their diameters ca. 0.06 mm.

Female sex unknown.

Identification. — The male of *Bolbohamatum syncopator* looks very much like those of *pseudogrande*, *phallosum*, *calanus*, and *robustum*, all these having a more or less similar cephalic and pronotal ornamentation. *B. pseudogrande* differs by having the clypeal teeth more or less connected at base, and by the protrusions 2p on the hind tibia being placed opposite to each other. Two of the other species mentioned above have similar protrusions 2p, only *robustum* having them distinctly shifted. As the only reliable character to separate *syncopator* from *robustum*, I would suggest the structure of the phallus.

Material examined. — Holotype only, from Bangla Desh: Sylhet (SMT).

The *laevicolle* group

6. *Bolbohamatum robustum* sp. nov. (figs. 13, 36, 45, 52, 55, 64)

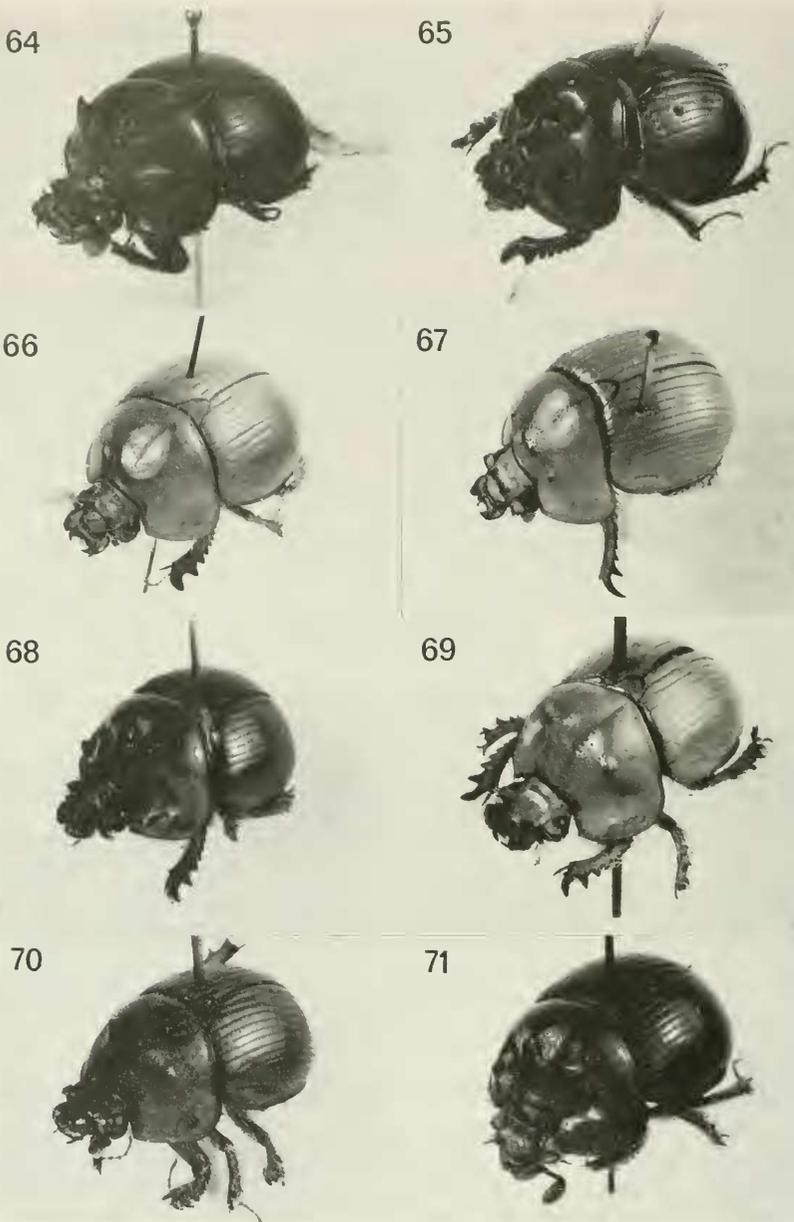
Holotype (male). — Approximate length 21.5, width 14, height 9.5 mm. Light-brown, subopaque; pilosity yellow-brown. Habitus, fig. 64.

Labrum emarginate in front, sides rounded; surface anteriorly limited by fine arcuate ridge, dorsal outline left mandible lobate. Cephalic contours, fig. 13. Clypeus with pair of dentiform tubercles; clypeal margin ridged, genae raised; marginal declivities rugulate-punctate; horizontal surface contiguously punctate to rugulate-punctate; clypeofrontal suture effaced. Frontal disc slightly depressed; posterior cushion indistinct, densely punctate; remainder of frons also abundantly punctate. Eye-canthus rugulate-punctate; frontolateral ridge extending from genae beyond eye.

Pronotal contours, fig. 13. Midline of pronotum impressed; base marginate; surface behind anterolateral angles concave; lateral horns upright; pronotal punctation double ($\times 25$); primary punctation dense, very dense laterally and behind vertex; secondary punctation very distinct behind lateral cavity; disc at some distance from base sparsely, indistinctly punctate, shiny. Scutellum (fig. 13) superficially, indistinctly punctate.

Juxtasutural punctures of elytra subobsolete; discal striae shallowly impressed, finely punctate; punctures separated by 6 ± 2 times their diameters; peripunctural impressions ill pronounced, not affecting interstriae. Elytral interstriae flat, distinctly microreticulate ($\times 50$), abundant minute punctation almost indistinct.

Phallus, fig. 36.



Figs. 64—71. *Bolbohamatum* males. 64, *robustum*, holotype, 21.5 mm; 65, *laevicolle*, Bengal, 19.5 mm; 66, *pyramidifer*, holotype, 19 mm; 67, *meridionale*, holotype, 18 mm; 68, *marginale*, holotype, 16 mm; 69, *kuijteni*, holotype, 17 mm; 70, *laterale*, Nagpur, 16.5 mm; 71, *drescheri indosinicum*, holotype, 18 mm.

Fore tibia with 2 + 6 external denticles. Middle and hind tibiae with setose fossorial elevations, proximally reduced to pairs of denticles; number of non-apical elevations on right middle tibia 1c—2ps—3ps—4ps, on right hind tibia 1c—2ps—3ps—4ps; complete anteapical crest bidentate, with ca. 10 long setae. Stridulatory granules on pygidium arranged in transverse row.

Some measurements in mm. Cephalic maximum length (exclusive of labrum and mandibles) 3.5, maximum width 5.3; distance tips of clypeal tubercles 1.5. Distance anterolateral angles of pronotum 5.9, tips paramedian tubercles 1.3, lateral tubercles 9.1; median length 7.6, maximum width 11.6. Median length of scutellum 1.8, width 2.2. Number of primary punctures on pronotal disc behind paramedian tubercles 6—10/0.25 sq. mm; punctures slightly elongate, ca. 0.10 × 0.08 mm.

Female sex unknown.

Identification. — *Bolbohamatum robustum* is externally very similar to *pseudogrande*, *syncopator*, *phallosum*, and *calanus*, and therefore, with this single male at hand, I am reluctant to discuss any slight external differences. The crossed paramerites of *robustum*, however, are most distinct, whereas the other characters mentioned in the synoptic table and the key readily distinguish between the three species of the *laevicolle* group.

Material examined. — Holotype only, from the "Himalaja" (Zoologische Staatssammlung, Munich).

7. *Bolbohamatum laevicolle* (Westwood) comb. nov.

(figs. 15, 35, 47, 51, 65)

Bolboceras laevicollis Westwood, 1848a: 385 (diagnosis, type-loc. East India); 1852: 22 (diagnosis), pl. 4 fig. 8 (fore-body).

Bolboceras grandis Westwood, 1848a: 384 (diagnosis, type-loc. East India?); 1852: 19 (diagnosis), pl. 4 fig. 3 (fore-body). Syn. nov.

Identification. — Externally the males of *Bolbohamatum laevicolle* are easily identifiable by the three usually well-defined, deep cavities separating the four pronotal tubercles. Superficially similar is *B. drescheri*, but its subspecies range from Burma to Java, whereas the pronotal cavities are less deep and less defined. *B. robustum* males, and those of some species outside the *laevicolle* group, are different by having their paramedian pronotal tubercles closely approximated. The females of *laevicolle* have a transverse ridge on the pronotum (see next section).

Variation and sexual dimorphism. — Length ♂ 19—20 mm, ♀ 20—21 mm. The males at hand are scarcely variant.

On the pronotal disc of the females there is a pair of lateral callosities separated by a distinct, feebly arcuate transverse ridge. Pronotum with dense to crowded primary punctation, except on basal part of disc.

Because one of the characters distinguishing *laevicolle* (males and females) is the simply arcuate outline of the left mandible, it appears most likely that *Bolboceras grande* Westwood, the type of which agrees in this and all other characters, is the female of *laevicolle*, and consequently they are synonymized here.

Material examined. — 6 males, 6 females.

The male holotype of *Bolboceras laevicollis* Westwood, which has its wings spread (Hope Dept. of Entomology, Oxford). The female holotype of *Bolboceras grandis* Westwood (same museum). And the following specimens:

India: Bombay (2 ♂, 1 ♀, BM, 1 ♀, BH); Himalaya (1 ♂, BH); Kotapad (1 ♂, BH); Nagpur (1 ♀, BH); Assam (locality illegible) (1 ♀, SMT); Bengal (1 ♂, SMT); no details (1 ♀, BH).

8. *Bolbohamatum pyramidifer* sp. nov.

(figs. 16, 37, 46, 66)

Holotype (male). — Approximate length 19, width 12, height 9 mm. Reddish yellow-brown, shiny; pilosity yellowish. Habitus, fig. 66.

Labrum emarginate in front, sides rounded; surface anteriorly limited by fine transverse ridge; dorsal outline of left mandible arcuate. Cephalic contours, fig. 16. Clypeus rugulate-punctate, punctures superficial; margin entirely ridged, genae raised; declivities with sculpture similar to that of horizontal surface; clypeofrontal suture effaced. Frons with pair of pyramidiform tubercles between eye-canths; posterior cushion and impression poorly pronounced, derm microreticulate ($\times 50$). Eye-canthus coarsely rugulate-punctate; frontolateral ridge straight, extending from gena beyond eye.

Pronotal contours, fig. 16. Midline on scarcely impressed; top of disc deplanate, anteriorly limited by arcuate ridge; lateral protrusions represented by simple callosities; base marginate; pronotal punctation double ($\times 25$); primary punctures densely set laterally, sparse on subbasal part of disc and on lateral callosities, elsewhere abundant. Scutellum (fig. 16) irregularly densely punctate.

Juxtasutural punctures of elytra subobsolete; discal striae shallowly impressed, finely punctate; punctures separated by 7 ± 3 times their diameters; peripunctural impressions ill pronounced, slightly affecting interstriae. Elytral interstriae scarcely convex; with scarcely distinct, sparse punctures, as well as microreticulation ($\times 75$).

Phallus, fig. 37.

Fore tibia with 2 + 5 external denticles. Middle and hind tibiae with setose fossorial elevations, proximally reduced to pairs of denticles; number of non-apical elevations in right middle tibia 1c—2po—3po—4, on right hind tibia 1c—2po—3po; complete anteapical crests bidentate, with setae of varying length. Stridulatory granules on pygidium arranged in transverse row.

Some measurements in mm. Cephalic maximum length (exclusive of labrum and mandibles) 3.1, maximum width 4.5; distance tips of clypeal tubercles 1.6. Distance anterolateral angles of pronotum 5.5; median length 6.3; maximum width 10.5. Median length of scutellum 1.6, width 2.3. Number of punctures of pronotal disc 12—17/sq. mm, their diameters ca. 0.1 mm.

Female sex unknown.

Identification. — *Bolbohamatum pyramidifer* is externally rather similar to *meridionale* because of the pyramidiform cephalic tubercles and the apparently

reduced pronotal ornamentation. *B. meridionale*, however, has its cephalic tubercles connected by a distinct, infuscated straight ridge; the same applies to the paramedian tubercles on its pronotum. The outer margin of the left mandible is in *pyramidifer* simply arcuate; the secondary punctures of the pronotal disc near the base are ocellate. The crossed paramerites place *pyramidifer* immediately in the *laevicolle* group.

Material examined. — Holotype only, from "Ind. or./Kotapad" (BH).

The *meridionale* group

9. *Bolbohamatum meridionale* sp. nov.

(figs. 17, 37, 46, 67)

Holotype (male). — Approximate length 18, width 12, height 8 mm. Yellow-brown, shiny; pilosity yellow-brown. Habitus, fig. 67.

Labrum emarginate in front, sides rounded; surface anteriorly limited by distinct, slightly curved ridge. Dorsal outline of left mandible lobate. Cephalic contours, fig. 17. Clypeus short; between eye-canths a pair of pyramidiform tubercles distinctly connected by transverse crest; clypeal margin ridged, genae scarcely raised; clypeofrontal suture effaced; clypeal surface, including declivities, finely rugulate-punctate. Frons and vertex with apparent double punctation because some of the punctures ($\times 18$) have an ill-defined peripunctural impression; frontal cushion and impression poorly pronounced. Eye-canthus coarsely rugulate-punctate; frontolateral ridge straight, extending from gena beyond eye.

Pronotal contours, fig. 17; midline of pronotum impressed; base marginate; discal protrusions small, paramedians connected by feebly, more or less infuscated ridge; pronotal punctation double ($\times 25$); primary punctation abundant, except on basal part of disc, somewhat confluent on shallow impression between paramedian and lateral tubercles; secondary punctation abundant. Scutellum (fig. 17) irregularly punctate, slightly wrinkled.

Juxtasutural punctures of elytra subobsolete ($\times 50$); discal striae distinctly impressed, distinctly punctate; punctures fine, infuscated, separated by 8 ± 3 times their diameters, lacking distinct peripunctural impressions. Elytral interstriae slightly convex, abundantly minutely punctate and microreticulate ($\times 50$).

Phallus, fig. 37.

Fore tibia with $2 + 5$ external denticles. Middle and hind tibiae with setose fossorial elevations, proximally reduced to pairs of denticles; number of elevations on right middle tibia 1c—2ps—3ps, on right hind tibia 1c—2ps—3ps; complete anteapical crests bidentate, with setae of varying length. Stridulatory granules on pygidium arranged in transverse row.

Some measurements in mm. Cephalic maximum length (exclusive of labrum and mandibles) 3.1, maximum width 4.8; distance terminal tips of transverse ridge 1.6. Distance anterolateral angles of pronotum 5.5, tips of paramedian protrusions 5.3;

maximum length 6.5, maximum width 10.7. Median length of scutellum 1.6, maximum width 2.2. Total number of primary punctures on pronotum behind paramedian protrusions 70—80, their diameters ca. 0.07 mm.

Female unknown.

Variation. — Not significant in the three males available.

Identification. — Males of *Bolbohamatum meridionale* are easily recognized by their cephalic and pronotal protrusions. *B. pyramidifer* looks like a poorly developed *meridionale*, but in case of doubt the characteristics of the parameres are decisive, those of *meridionale* lacking the strongly sclerotized, crossed paramerites. The cephalic pyramids are differently oriented in the two species. *B. pyramidifer* has a simply arcuate outline of the left mandible, which in *meridionale* is sinuate-lobate. The protrusions 2p on the hind tibia are more or less opposite in *pyramidifer*, shifted in *meridionale*.

Material examined. — Holotype from Sri Lanka: Colombo (National Museum, Colombo). Two male paratypes, one from Sri Lanka: Batticaloa, vi.1915, Baker (BM), the other from India: Pondicherry, Martin (P).

This is the only species known from Ceylon.

The *laterale* group

10. *Bolbohamatum marginale* sp. nov.

(figs. 20, 40, 43, 68)

Holotype (male). — Approximate length 16, width 10.5, height 8 mm. Medium-brown, shiny; pilosity yellow-brown. Habitus, fig. 68.

Labrum emarginate in front, sides rounded; surface anteriorly limited by arcuate ridge. Dorsal outline of left mandible lobate. Cephalic contours, fig. 20. Clypeus with pair of dentiform tubercles, each placed against lateral margin; clypeal margin weakly ridged, genae raised; marginal declivities rugulate-punctate; horizontal surface irregularly contiguously punctate; clypeofrontal suture effaced. Frontal disc slightly depressed; posterior cushion distinct, very sparsely punctate; remainder of frons with variably abundant punctures of two size classes. Eye-canthus irregularly contiguously punctate; frontolateral ridge contiguous with inner border of eye, extending beyond eye, adjacent frontal surface impressed.

Pronotal contours, fig. 20. Midline of pronotum slightly impressed; base submarginate, medially virtually emarginate; pronotum with paramedian and lateral tubercles. Median longitudinal zone and lateral declivities of pronotum densely, coarsely punctate; secondary punctation ($\times 25$) evenly distributed, abundant; impression between paramedian and lateral tubercles virtually devoid of punctures (secondary punctation vague), opaque, due to microreticulation ($\times 50$). Scutellum (fig. 20) virtually impunctate.

Juxtasutural punctures of elytra obsolete ($\times 50$); discal striae shallowly impressed, finely punctate; punctures separated by 7 ± 2 times their diameters; diameters of punctures in stria 1 strongly increasing on distal declivity, to 0.1 mm,

separated by 2—3 times their diameters; these punctures deep, well defined, distinctly affecting adjacent interstriae. Elytral interstriae scarcely convex, except distal section of 1, which is strongly convex; interstriae shiny, sparsely micropunctate ($\times 50$).

Phallus, fig. 40.

Fore tibia with 2 + 5 or 6 external denticles. Middle and hind tibiae with setose fossorial elevations, proximally reduced to pairs of denticles; number of non-apical elevations on right middle tibia 1c—2ps—3, on right hind tibia 1c—2ps—3ps; complete anteapical crest bidentate, with setae of varying length. Stridulatory granules on pygidium scattered.

Some measurements in mm. Cephalic maximum length (exclusive of labrum and mandibles) 3.0, maximum width 4.3; distance tips of clypeal tubercles 1.6. Distance anterolateral angles of pronotum, tips paramedian tubercles 1.3, tips lateral tubercles 7.2; median length 6.2, maximum width 9.6. Median length of scutellum 1.3, maximum width 1.7. Number of punctures on anterior declivity of pronotum 35—40, their diameters ca. 0.1 mm.

Variation and sexual dimorphism. — Length σ 14—17, ♀ 14.5—17 mm. Ornamentation of head and pronotum of smaller males more or less reduced.

A male from Mahé has its paramedian pronotal tubercles wider apart than the other specimens. A male from Wallardi is rather different from all the others, particularly because the small clypeal teeth stand exactly between the genal angles; the pronotum of this male is anteromedially feebly bicallose, whereas the first elytral stria is distally only slightly impressed and scarcely more strongly punctate. Length of that specimen ca. 15.5 mm.

Identification. — The males of *Bolbohamatum marginale* have strongly approximated paramedian tubercles on the pronotum, and a pair of lateral tubercles situated almost marginally. By the latter character they are easily separable from other species with approximated paramedian tubercles; other species with the lateral protrusions placed far apart lack the strongly impressed, more coarsely punctate distal section of elytral stria 1. The slight differences in this character with *kuijteni*, possibly important for the recognition of individual females, have to be verified on more material. The basal capsule of the phallus of *marginale* is very robust compared to those of *laterale* and *kuijteni*, and reminds one of the *drescheri* group treated hereafter. The elytral striae 2 etc. of both *marginale* and *kuijteni* are very feebly punctate.

Material examined. — 14 males, 9 females.

Holotype from India: Baihar [sic!]: Balaghat, 21.vii.1927, B.M. Bhatia (BM). Paratypes as follows:

India: Boria (Jubbulpore), 30.vi.1934, Chatterjee (1 σ , Forest Res. Inst. and Colleges, Dehra Dun); Kodama Hills*, 5.[?].1934 (1 σ , BH); Mahé (1 σ , P); Mercara (1 σ , 1 ♀ , BH); Motinala River, 13.vi.1927, Chatterjee (1 σ , BM); Nilgiri Hills, Downing (1 σ , BM); ditto, Andrewes (4 σ , 1 ♀ , BM); Surada, Babault (1 σ , 1 ♀ , P); Travancore: Wallardi*, 5.ix.1903, Faire (1 σ , excluded from type-series, P); South Mysore (1 σ , BM); "India/Orient" (1 σ , BM).

Six females not associated with males excluded from type-series, from India:

Anamalais (1 ♀, BM); Belgaum, 29.vii.1906, Bell (2 ♀, BM); Mountabu, 1940, McCann (1 ♀, Bombay Natural History Society). Pakistan: Karachi, Bell (2 ♀, BM). Not mapped.

11. *Bolbohamatum kujitani* sp. nov.

(figs. 19, 39, 42, 53, 69)

Holotype (male). — Approximate length 17, width 10.5, height 8 mm. Yellow-brown, shiny; pilosity yellow-brown. Habitus, fig. 69.

Labrum emarginate in front, sides rounded; surface anteriorly limited by fine arcuate ridge. Dorsal outline of left mandible lobate. Cephalic contours, fig. 19. Clypeus bituberculate, tubercles high, posteriorly with 2 vague carinulae running from tip to base; tubercles contiguous with clypeal margin; clypeal margin ridged, genae raised; marginal declivities rugulate-punctate; clypeofrontal suture effaced. Clypeofrons with double punctation ($\times 25$); primary punctation abundant, fine, density decreasing caudad; vertex with similar punctation, but primary punctures larger and restricted to lateral parts; posterior cushion arcuate, more or less costiform. Eye-canthus coarsely, irregularly punctate; frontolateral ridge extending from gena beyond eye.

Pronotal contours, fig. 19. Midline of pronotum impressed; transition from disc to anterior declivity gradual; base submarginate, medially virtually emarginate. Pronotal declivity in front of paramedian tubercles abundantly, distinctly punctate, punctures separated by one to several times their diameters; punctation sparse elsewhere; secondary punctation abundant, but scarcely distinct ($\times 50$). Scutellum (fig. 19) virtually impunctate.

Juxtasutural punctures of elytra subobsolete; discal striae shallowly impressed, finely punctate; punctures separated by 10 ± 5 times their diameters; diameters of punctures in stria 1 strongly increasing on distal declivity to 0.15 mm, separated by 2—3 times their diameters; these punctures well defined, deep, distinctly affecting adjacent interstriae. Elytral interstriae scarcely convex, except distal section of 1, which is strongly convex; interstriae microreticulate ($\times 75$), punctures scarcely distinct.

Phallus, fig. 39.

Fore tibia with 2 + 6 external denticles. Middle and hind tibiae with setose fossorial elevations, proximally reduced to pairs of denticles; number of non-apical elevations on right middle tibia 1c—2ps—3, on right hind tibia 1c—2po—3po; complete anteapical crest bidentate, with setae of varying length. Stridulatory granules on pygidium scattered.

Some measurements in mm. Cephalic maximum length (exclusive of labrum and mandibles) 3.0, maximum width 4.2, distance tips of clypeal tubercles 1.7. Distance anterolateral angles of pronotum 4.8, tips paramedian tubercles 4.7, tips lateral tubercles 7.3; median length 6.3, maximum width 9.30. Median length of scutellum 1.2, maximum width 1.9. Number of punctures on anterior declivity of pronotum ca. 15/sq. mm, their diameters 0.07—0.10 mm.

Female sex unknown.

Variation. — Length ♂ 14.5—17 mm. Cephalic and pronotal ornamentation somewhat reduced in the small specimens.

Identification. — *Bolbohamatum kuijteni* males may be confounded with those of *drescheri birmanicum*, which also have their paramedian pronotal tubercles wide apart. The latter, as well as *B. laterale*, however, has a much denser pronotal punctation. Compared to most other species *kuijteni* is very shiny dorsally. With *B. marginale* the species agrees in having a strongly impressed, coarsely punctate distal section of elytral stria 1, but the pronotal ornamentation of the males is very different. The aforesaid impression and punctation of stria 1 seems stronger in *kuijteni* than in *marginale*, a character that could be important for the recognition of individual females. The basal capsule of the phallus of *kuijteni* is narrow, rather slender compared to that of *marginale*, whereas the paramerites have a characteristic shape.

Material examined. — 8 males.

Holotype from India: Gersappa, 19.vi.1907 (Bombay Natural History Society, Bombay). Paratypes as follows:

India: Gersappa, 28.vi.1907 (1 ♂, Bombay Natural History Society, Bombay); ditto, no date (1 ♂, BM, 1 ♂, Bombay); Igatpuri, 200 ft (1 ♂, BM); Kanara (1 ♂, BM, 1 ♂, Zoologiske Museum, Copenhagen). No data (1 ♂, Senckenberg-Museum, Frankfurt).

Note. — This species is dedicated to my friend P. J. Kuijten who, many years ago, introduced me to the fascinating world of scarabs.

12. *Bolbohamatum laterale* (Westwood) comb. nov.

(figs. 18, 38, 44, 70)

Bolboceras lateralis Westwood, 1848a: 385 (diagnosis, type-loc. Gogo); 1852: 22 (diagnosis), pl. 4 fig. 10 (fore-body).

Identification. — *Bolbohamatum laterale* males are very distinct by their pronotal protrusions and by the heavy double punctation of virtually the entire pronotum. The two other species in the *laterale* group have two pairs of pronotal protrusions instead of one, while their first elytral stria is distally more strongly impressed and more coarsely punctate than proximally. Female sex not known for certain, but four females with a heavily punctate pronotum, lacking the transverse row of pygidial granules, and with a medially dentate frontal ridge, may indeed belong to *laterale*.

Variation. — Length ♂ 17—18 mm. Further characters, e.g. anterolateral impressions of pronotum, slightly variant.

Material examined. — 5 males, 4 females.

The male holotype, which, in addition to "lateralis Westw.", bears a label reading "tuberculatus/Hope Gogo"* , plus the usual labels of the Hope Dept. of Entomology, Oxford. Further specimens as follows:

India: Belgaum, at light (1 ♂, BM); Darjeeling (2 ♀, P); Mhow (1 ♀, BM); Nagpur, 31.vii.1916, d'Abreu, 1000 ft (1 ♂, BM); Sagoda (Purna R.), 3.ix.1929, Chatterjee (1 ♀, BM); Kashmir, Hügel (1 ♂, SMT).

The *drescheri* group13. *Bolbohamatum drescheri* sp. nov.

(figs. 1, 21—24, 41, 56, 71)

Holotype (male). — Approximate length 18.5, width 12.5, height 8 mm. Yellow-brown; subopaque, pronotal disc shiny; tips ridges, margins, sutures more or less infuscated; pilosity yellowish. Habitus, fig. 1.

Labrum emarginate in front, sides rounded; surface with fine arcuate ridge. Dorsal outline of left mandible lobate. Cephalic contours, fig. 1. Clypeus bidentate; surface rugulate-punctate, punctures superficial; margin entirely ridged, genae raised; marginal declivities high, sculpture similar to that of horizontal surface; clypeofrontal suture indistinct. Frons abundantly, irregularly punctate. Vertex with transverse cushion, posteriorly limited by transverse impression. Eye-canthus rugulate-punctate; frontolateral ridge extending from genae beyond eye.

Pronotal contours, fig. 1. Midline of pronotum impressed; base submarginate; pronotal punctation double ($\times 25$); primary punctures densely set, except in lateral cavities and on disc at some distance along base (where primary punctures are most distinct). Scutellum (fig. 1) irregularly densely punctate.

Juxtasutural punctures of elytra subobsolete; discal striae shallowly impressed, finely punctate; punctures separated by 10 ± 5 times their diameters; peripunctural impressions ill pronounced, scarcely affecting interstriae. Elytral interstriae scarcely convex, sparsely, minutely punctate as well as microreticulate ($\times 75$); punctation simple, punctures separated by more than 5 times their diameter.

Phallus, as paratype, fig. 41.

Fore tibia with 2 + 6 or 7 external denticles. Middle and hind tibiae with setose fossorial elevations, proximally reduced to pairs of denticles; number of non-apical elevations on right middle tibia 1c—2ps—3, on right hind tibia 1c—2ps—3ps—4; complete anteapical crest bidentate, with setae of varying length. Stridulatory granules on pygidium scattered; elytral files present.

Some measurements in mm. Cephalic maximum length (exclusive of labrum and mandibles) 3.1, maximum width 5.0; distance tips of clypeal tubercles 1.5. Distance anterolateral angles of pronotum 5.8, tips paramedian tubercles 2.4, lateral tubercles 7.2; median length 6.6, maximum width 11.3. Median length of scutellum 1.5, width 2.0. Number of punctures between paramedian tubercles on pronotum 6—10/0.25 sq. mm, their diameters ca. 0.1 mm.

Variation and subspecies. — Within *Bolbohamatum drescheri* there is a notable geographic variation in the distance of the paramedian pronotal protrusions and the direction of the axes of these (figs. 22—24). The populations of Java are remarkably constant in these male characters, the distance of the tubercular tips being always less than half the distance between the anterolateral angles of the pronotum, whereas the axes of the cones are usually inclined to the pronotal midline. The Burmese specimens always have their pronotal cones much wider apart, up to slightly over 0.75 of the distance between the anterolateral angles,

whereas the cones stand outward or upright. The Indo-Chinese and Chinese populations seem more variable, but the paramedian tubercles of the majority of the males from Vietnam and Cambodia appear to have the same distance as in those of Java; the axes of the cones, however, are not inclined. The larger males from Burma and Indo-China have a distinct transverse costa between the paramedian pronotal tubercles.

On the basis of the characters mentioned, the populations of Java, Indo-China and Burma are here considered to belong to three different subspecies, *d. drescheri*, *d. indosinicum* and *d. birmanicum*. The few Chinese specimens could not be placed. One male and three females from Laos (3 localities) are assigned to *birmanicum*¹). In addition to this geographic variation the usual reduction of the pronotal ornamentation is observed in smaller males. I have one doubtful male from Palone (Burma), only with very feeble paramedian pronotal protrusions, placed under *drescheri* because of its stridulation apparatus and its phallus. This male is recorded under *d. birmanicum*.

Total length 15.5—21 mm.

Identification. — *Bolbohamatum drescheri* males have a most characteristic phallus, its basal capsule being very large compared to the aedeagus. The lateral tubercles on the pronotum stand very wide apart, their distance exceeding that of the anterolateral angles (see measurements of holotype of *d. drescheri*). *B. marginale* and *kuijteni* are similar in this character, but differ in that their clypeal tubercles are situated directly against the marginal ridge. Contrary to *drescheri*, is the elytral stria 1 in *marginale* and *kuijteni* distally strongly impressed and strongly punctate. There are no records of *drescheri* from localities west of Burma.

Material examined. — Not allocated to subspecies mentioned below: 3 males, 2 females, all paratypes, as follows:

China: Hongkong: Taipokan, 10.vi.1964, Voss & Wai Ming Hui (1 ♀, Bishop Museum, Honolulu); H. Kung [? Hongkong] (1 ♂, BM); Tonglok [? North of Hongkong] (1 ♂, BH); Hupe: Ichang (1 ♀, BH; northernmost locality, province correct?); China (1 ♂, BM).

The above specimen description pertains to the holotype of the nominate subspecies, mentioned hereafter.

Note. — This species is named after F. C. Drescher (1875—1957), ardent collector of Indonesian beetles.

13a. *Bolbohamatum drescheri* subsp. *drescheri* nov.
(figs. 1, 24, 41)

Material examined. — 32 males, 31 females.

Holotype ♂ from Java: Tjideres, 24.xii.1935, F. C. Drescher, 100 m (Museum Zoologicum Bogoriense). Paratypes as follows:

¹) In principle a good series representing a local population is needed to establish the subspecific identity of individuals (see e.g. Mayr, 1963: point 3 on p. 349), but this is scarcely ever practicable due to the usual paucity of material in taxonomic collections. The features used here for the delimitation of subspecies seem constant enough to justify the present treatment.

Java: Ardja Sari (1 ♂, 2 ♀, L), ditto, 1923 (1 ♀, L); Bandung, 23.vi.1930, Drescher, at light (1 ♂, P), ditto, 12.vi.1936, Drescher, 750 m (1 ♂, Bogor); Bantam, L. de Vos (1 ♂, 3 ♀, L); Bantam (1 ♂, 1 ♀, L); Batavia [= Jakarta], De Gavere (1 ♀, L), ditto, xi.1815 (2 ♀, Zoologische Museum, Copenhagen); Bogor: Gunung Batu, 25.xii.1936, Van der Vecht, at light (1 ♂, L); Sukabumi (1 ♂, SMT); Gunung Tjerimai, 30.vi.1926 (1 ♀), 4.viii.1926 (1 ♂), Drescher (Bogor); Tjideres, 24.xii.1935 (1 ♀), 10.i.1936 (3 ♀), i.1936 (1 ♂), vi.1936 (1 ♂), vii.1936 (1 ♀), 28.x.1936 (1 ♂), xi.1936 (3 ♂, 4 ♀), 24.xii.1936 (2 ♂, 1 ♀), 27.xii.1936 (1 ♂), iii.1937 (1 ♀), vii.1940 (1 ♂), xii.1940 (2 ♂), vi.1941 (1 ♀), xii.1941 (1 ♀), i.1942 (1 ♂), ii.1945 (1 ♂), xii.1946 (2 ♀), iv.1948 (1 ♀), all Drescher, 35—100 m (Bogor, except 1 ♀, P); Gunung Muria: Tjolo, ii.1934 (1 ♂), 20.iii.1934 (1 ♂), 30.iv.1934 (1 ♂, 1 ♀), Van Doesburg (all L); Preanger (1 ♂, 3 ♀, BH); Java, Aulie (1 ♂, L); Java, one, xii.1815 (♂, BM, Copenhagen, Institut Royal des Sciences naturelles de Belgique); no data at all (1 ♂, in last-mentioned museum, placed sub *calanus* by Gillet).

13b. *Bolbohamatum drescheri* subsp. *indosinicum* nov.

(fig. 23, 71)

Material examined. — 3 males, 5 females.

Holotype male from Vietnam: Saigon (L, donated by Y. Cambefort). Paratypes as follows:

Vietnam: Mont de Chaudoc, 1877, Harmand (1 ♀, P); Dong-Dang (Quang-Si frontier), 1901, Lucas (1 ♀, P); Lang-Son, 1904, Neau (1 ♂, P); Luc-Nam region, Blaise (1 ♂, 1 ♀, P); Phu Tho, Duport (1 ♂, P); Saigon (1 ♂, Institut Royal des Sciences naturelles de Belgique); Tonkin (1 ♂, P); Cochinchine, 1898, Amiral Vignes (1 ♀, P); Cochinchine, Amais (1 ♂, P); Cochinchine (1 ♂, P). — Cambodia, no details (1 ♀, SMT).

Some of these specimens were apparently seen by Paulian, and recorded as *calanus* (1945: 41).

13c. *Bolbohamatum drescheri* subsp. *birmanicum* nov.

(figs. 21, 22)

Material examined. — 12 males, 15 females.

Holotype ♂ from Burma: Rangoon (P). Paratypes as follows:

Burma: Maymyo, Downing (1 ♂, 1 ♀, BM); Myitkyina, 30.viii-1.ix.1914 (1 ♀, BM); Rangoon, 8.vi.1898 (1 ♀, BM), ditto, v.1886, Fea (1 ♂, Genoa), ditto, Meggitt (1 ♂, 1 ♀, U.S. National Museum), ditto, v.vi.1927 (1 ♀, same museum), ditto, 1933—34 (1 ♂, BM); S. Shan States: Taunggyi, 1.viii-22.ix.1934, Malaise, 1500 m (1 ♀, Naturhistoriska Riksmuseet, Stockholm); Tharrawaddy (1 ♀, BM); Toungao (1 ♀, BM); N. Chin Hills (1 ♂, BM); Tenasserim (1 ♀, SMT); Lower Burma (2 ♀, BM); North/Upper Burma (1 ♂, 1 ♀, BM); Burma (3 ♂, BM, P). — Laos: Houei Sai, 2.vi.1918, Vitalis de Salvaza (1 ♀, BM); Paklay, 1963 (1 ♂, 1 ♀, Zoologische Staatssammlung, Munich); Luang Prabang, ix.1917, Vitalis de Salvaza (1 ♀, BM).

I have excluded from the type-series a small male (long 16 mm) with feeble paramedian protrusions and subopaque elytra, with labels reading "Inde", "Palone/6.87", "Ex Museo/Bonvoiloir", from the Boucomont collection in P. This may indeed be a representative of *birmanicum*, a geographical confirmation being found in Boucomont & Gillet (1921: 70, "Palon, Birmanie").

Notes. — This subspecies of *drescheri* was by several workers, including G. J. Arrow, identified as *Bolboceras nigriceps* Westwood, but I can find no reason to accept this, the type, apparently a female, not having been recognized beyond doubt in the material at hand. The present females of *d. birmanicum* do not agree with Westwood's drawing (1852: pl. 4 fig. 17).

Although the females from Burma and Laos listed above are slightly variable in size, shape of frontal ridge and development of tibial protrusions, the material as a whole seems homogeneous. Therefore these females, associated with males or not, have all been labelled paratype.

DUBIOUS SPECIMENS, RECORDS, NAMES

Dubious *Bolbohamatum* specimens

Material not identified to species. — 29 females (probably nearly all *calanus* or *phallosum*); 4 males. These males had no phallus, or they were damaged or misshapen. Localities as follows:

India: Bangalore; Bellahunsi; Belgaum; Bombay; Dehra Dun; Getara; Igatpuri; Kasawa (Bombay); Madras; Mahé; Namakal*; Nilgiri Hills; Surat; Sylhet; Travancore; S. Bombay; E. India; N. W. India. — Singapore; Java (mislabelled!). Months vi—xi (9 specimens). Collections BM, P, SMT; Institut Royal des Sciences naturelles, Brussels; Zoologiske Museum, Copenhagen; Senckenberg-Museum, Frankfurt.

Before me are also 2 females seen by Westwood, one originating from the "Boys Sale", with a label in what seems to be Westwood's hand, reading "*calanus* ♀?"; this specimen is in Oxford. The other, from the BM, is labelled "E. Ind//48/22" (round label), and I wouldn't be surprised if this were the specimen on which Westwood based his *nigriceps*. There is a third old female specimen in the Paris museum, from the collection of "Laferté./5894", "Ex-Musaeo/D. Sharp 1890".

The female from Sylhet mentioned above (SMT, length 15.5 mm) has unusually developed fossorial protrusions on the hind tibiae; the formula of the right tibia is 1c—2—3ps—4po—5po, of the left 1c—2ps—3ps—4ps. The female from the Nilgiris mentioned above (Brussels museum), is very large (19 mm long) and seems different from other *calanus*-like females, i.a. by the frontal carina (crest in frontal view bisinuate).

Dubious *Bolbohamatum* records

Material not recovered. — Under *Bolboceras calanus* Westwood, Paulian (1945: 41): Vietnam: Chapa; Pays Moi; Taiwan. The last record may be based on the unreliable work of Miwa (1931).

Dubious names: possibly *Bolbohamatum*

Bolboceras bicarinatum Westwood, 1852: 24, pl. 4 fig. 15. — East India. — Type not recognized; female?

Bolboceras nigriceps Westwood, 1852: 25, pl. 4 fig. 17; 17 a—b (where are these?). — Distribution not mentioned. — Type not recognized (see also under dubious specimens).

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